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BERLIN INQUIRY.

The court of inquiry to inquire into the loss of the Great Eastern Railway Co.'s steamer Berlin gave judgment recently in the form of answers to six questions submitted by the London Board of Trade.

The first three had to do with the compasses, charts and sailing directions, seaworthy condition, life-saving appliances, etc., all of which it was found had been in excellent condition.

The fourth, fifth and sixth questions and their answers follow, together with the judgment of the court:

4. What was the cause of the stranding of the vessel on or near the north pier of the new waterway, Hook of Holland, on the morning of February 21, and her subsequent loss?

Answer.—The cause of the stranding of the vessel on or near the north pier or breakwater of the new waterway, Hook of Holland, on February 21 last, and her subsequent loss, was an error of judgment on the part of her master. This error of judgment consisted in his attempt to enter the new waterway in the condition of the weather then prevailing, and in his underestimating the effect of the send of the sea and the force of the tide on his vessel when he did make the attempt. On her passage across the North Sea from Parkeston Quay, Harwich, the vessel had experienced the full force of a severe northwesterly gale which caused a dangerous breaking sea in the vicinity of the gas buoy situated about three-quarters of a mile from the extremity of the northern breakwater of the new waterway, Hook of Holland. Shortly after the vessel passed this gas buoy, at a speed of 15 or 16 knots an hour, rolling heavily, a heavy sea struck her on the port quarter, causing her to broach to about five points to the northward of her course. The helm was put hard aport, the starboard engines were stopped and reversed full speed astern, and the port engine kept full speed ahead. Under the action of the rudder and engines the vessel was brought round with her head towards the southwest, but in executing this maneuver she drifted through the action of the tide, wind, and sea, too close to the northern extreme of the breakwater to clear it, and struck it with her port bilge twice, the first time not heavily, the second time she impaled herself on the submerged part of the breakwater and became a total wreck.

5. Was proper discipline maintained on board after the vessel struck? What were the circumstances in which so many lives were lost?

Answer.—Proper discipline was maintained on board after the vessel struck. The circumstances in which so many lives were lost were as follows:—After the vessel struck the breakwater, as described in the answer to question 4, she remained on it, with a heavy list to starboard, fully exposed to the force of the northwesterly gale and frequent snow storms, with heavy seas constantly breaking on board sweeping her decks fore and aft. In a few minutes the seas tore away the bridge, smashed up the boat shelter, the boat deck, and the boats, carrying them overboard, together with the men who were endeavoring to clear them away for use. The passengers had all been summoned on deck and supplied with life-belts. By the directions of the officers life-lines were stretched along the deck for their security, but from time to time many were swept off the exposed decks into the sea. In less than two hours after the stranding the forward part of the ship broke away and disappeared, and all who were on it were lost. The after part of the vessel remained impaled on the breakwater, and the survivors eventually found partial cover under the lee of the engine-room skylight. About 25 of these huddled up together there, but their numbers were soon thinned, as they died from exposure or were washed overboard, the survivors remaining in that state until 4 p. m. of the succeeding day, Friday, February 22, when the Dutch lifeboat crew rescued 11 of them who were able to slide down a rope on to the breakwater. The remaining three women who were able to help themselves by this means were rescued later by Capt. Sperling about 1 a. m. on the following morning. It must be noted that in consequence of the heavy sea prevailing it was impossible to approach the breakwater, and from the time the vessel stranded every possible effort was made by the Dutch lifeboat men to effect communication with the wreck and save life, and the rescue of the survivors was effected at the earliest possible moment.

6. Was the vessel managed and navigated at all material times with proper and seamanlike care?

Answer.—The vessel was not managed and navigated at all material times with proper and seamanlike care. The court considers it advisable to indicate in general terms the imminent risk of disaster which those masters incur who, when entrusted with many lives and with valuable property, take the responsibility of running unnecessary risk from a sense of over-confidence or from a desire to please those whom they serve.

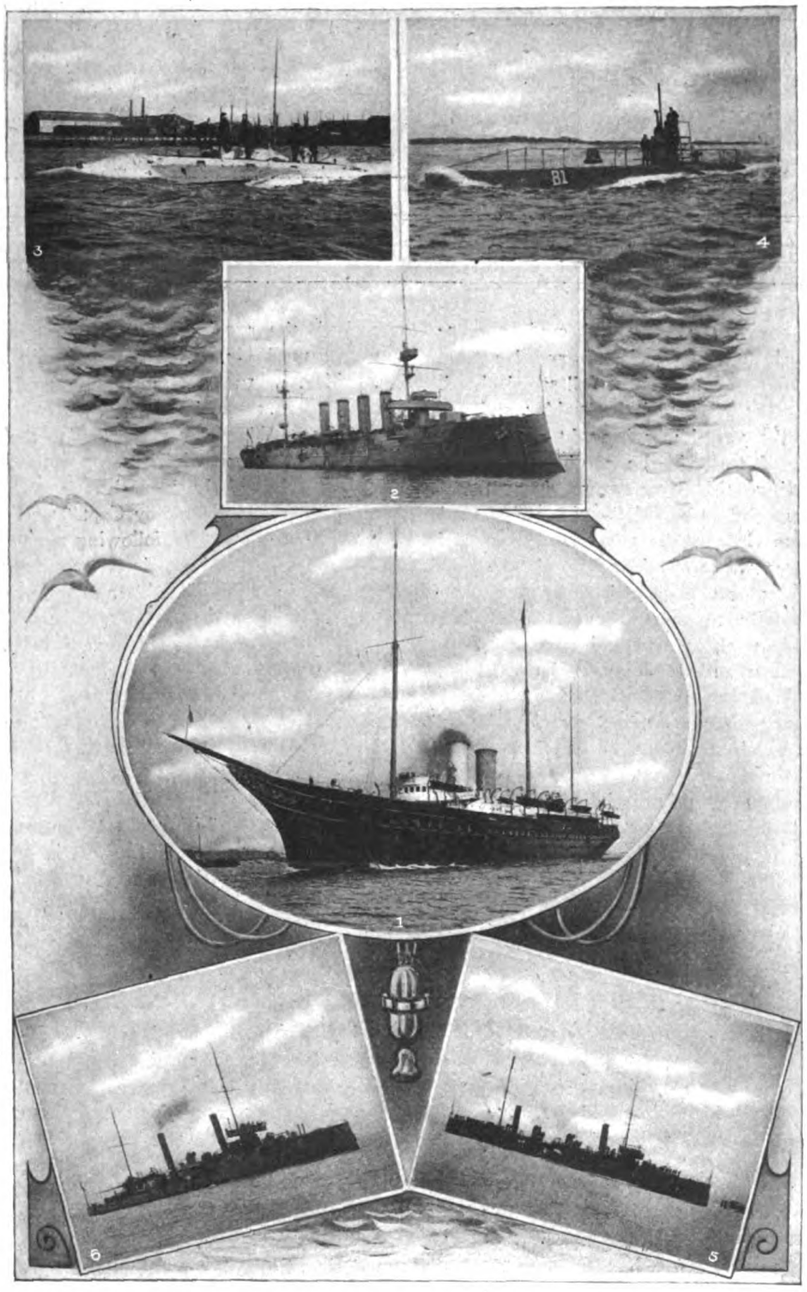
The judgment of the court, therefore, is:—The court having carefully inquired into the circumstances attending the above mentioned shipping casualty finds the stranding and loss of the Berlin were due to an error of judgment on the part of her master in attempting to enter the new waterway, Hook of Holland, at about 4:40 a. m. on February 21 last, during a heavy northwesterly gale, and in failing to make a sufficient allowance for the strength of the tide, wind and sea, when endeavoring to make the entrance, whereby the vessel stranded on the breakwater and became a total wreck with large loss of life.

No comment was made on the decision of the court, and the proceedings concluded.

ADMIRALTY TESTS OF SUBMARINE SIGNALING.

The Submarine Signal Co., of Boston, has recently put before the public the results of the British admiralty's comprehensive tests of submarine signaling.

It is so unusual for the British admiralty to permit the publication of its endorsement of a patented article that their consent in the present instance indicates their desire to assist the Submarine Signal Co. in securing the speedy adoption of an invention which, in the language of the admiralty report, will enable ships fitted with receiving apparatus "to navigate in fog with almost as great certainty as in clear weather."



VESSELS OF THE BRITISH NAVY DETAILED TO CONDUCT THE REMARKABLY SUCCESSFUL TRIALS OF SUBMARINE SIGNALING, AT THE PORTSMOUTH (ENGLAND) NAVY YARD, NOVEMBER, 1906.

1. Royal Yacht VICTORIA AND ALBERT, fitted to receive submarine signals as a result of the tests. 2. British armored cruiser, ANTRIM, which heard the submarine bell up to and including 16 miles. 3. Holland Submarine No. 1. 4. Submarine B 11, which demonstrated that submarine signals are the only means of communication with submarine boats. 5. H. M. S. HARRIER and DRYAD, fitted to send and receive submarine signals. 6. H. M. S. SPANKER, fitted with submarine bell, which sent long code messages to the ANTRIM, 5 miles distant.

The following is taken from the admiralty report:

The trials may be divided into three portions:

I. To discover the utility of the apparatus as an aid to navigation.

II. To discover its utility for signaling purposes.

III. To discover its utility for signaling to submarine boats.*

The trials were conducted with H. M. S. Spanker, fitted with a submarine signal bell of the kind usually fitted in U. S. light vessels, and H. M. S. Antrim, fitted with two receiver tanks placed 20 ft. below the water line, containing microphones connected by insulated wires with a switch-box in the chart-house, the switch-box being fitted with ear pieces.

In the preliminary trials, which were conducted in Portsmouth harbor, Oct. 6, the bell was kept at work for a whole afternoon, all the ships at buoys and moorings reporting that the bell could be heard plainly except those which were divided from the Spanker by dry land or mud dry at low water.

On Oct. 30 more exhaustive trials were conducted in which H. M. S. Niger was included in order that wireless communication might be kept up in case the bell should not be rung.

These tests were conducted with the vessels at various distances apart and the Antrim going at various speeds, the first test being at a distance of five miles. In this instance it was shown that by shifting the vessel to various points of the compass the vibrations on the port and starboard sides could be made to indicate the exact direction of the signal bell with certainty, and this at a distance beyond the certain range of any of the aerial sound signals in use by light vessels in fog.

The remaining experiments were conducted at distances of 7½, 10, 14 and 16 miles.

In the test at ten miles distance and with the Antrim going five knots an interesting conclusion was reached.

The Antrim was turned to bring the Spanker to bear on the port beam, going 14 knots; the bell was heard when the Spanker bore two points abaft the port beam, when it was abeam, and a little before the beam the note was very clear and musical. Speed was then reduced to five knots, and the ship allowed to

*The reports of the trials with submarines were altogether satisfactory; but since they relate solely to naval use of submarine signaling they are not made public.

swing slowly up to port to bring the Spanker across the bow as in the previous experiment. Capt. Oliver, standing in such a position that he could not tell how the Antrim was heading, listened with the port microphone connected; the sound was loud at first, gradually becoming fainter; when he lost it the direction of the ship's head was noted by another observer and the starboard microphone immediately switched on, and as soon as the sound was audible again the direction of the ship's head was again noted.

The result was that the sound was lost with the port microphone when the Spanker was half a point on the port bow and picked up with the starboard microphone when she bore half a point on the starboard bow, the mean of the two being the exact bearing of the Spanker.

In the experiments at 14 and 16 miles the signals were heard quite plainly but only when the engines were stopped. After the experiment at 16 miles distance the Spanker was closed to a distance of five miles and signaling by a code was tried. The ship was stopped and by means of a tape recording device operated by the listener the following message was sent and received correctly:

"The king went to Bath last night in a motor car which did not break down, and from there proceeded to Hythe."

The report states that it is probable that this sort of signaling is feasible at a distance of ten miles, since the bell was heard almost as loud and clear at that distance in the other experiments.

By the possession of wireless telegraphy and siren signals, the conditions of fog are more or less catered to, but what these submarine bell signals appear at first sight, peculiarly adapted for, is:

(a) Signals between ships when a fog prevails, and direction of the ship signaling is a matter of great importance.

(b) As the range of signaling between submarine vessels and their parent ships is limited to visual range, which by day is only a mile or two in the finest weather, and at night may be described as almost nil, because of the unavailable skill required to read flashing; then some sound which, being the musical chime of a bell, is unmistakable for any other, and which is receptive by any individual who has no signal skill, *must essentially be of great importance to a service—peculiar to submarine boats—where an alternative hardly exists.*

The results obtained in these tests demonstrate the extreme utility of the submarine bell as an adjunct to coastal navigation in thick weather.

The fog signals at present in use in light ships in Great Britain cannot be depended on to be heard in all conditions, even at one or two miles' distance, and a vessel failing to make the fog signal out, may be on a safe course and in her estimated position, yet she must stop or anchor or alter course out, because she is uncertain. The submarine bell increases the range at which the fog signal can be heard by a vessel until it approximates to the range of a light vessel's light in clear weather, and, moreover, its bearing can be determined with quite sufficient accuracy for safe navigation in fog from distance far beyond the range of aerial fog signals, if the vessel is equipped with receivers.

Even should a vessel not be so equipped, the submarine bell can be heard from below the water line for distances which are well outside the range of aerial fog signals, although its direction cannot then be so well determined.

To double or treble the distance at which fog signals can be heard is a great advantage to shipping, and the facility of determining the direction of a sound signal is in itself a very valuable discovery. The installation of submarine bells in British light vessels must come sooner or later, as it is proved to a great extent by its adoption by other nations that those who wait longest will incur the greatest loss in the meantime, both in ships and lives, and through delays to shipping which would otherwise be avoided.

INTERESTING EXPERIMENTS IN SUBMARINE SIGNALING.

An interesting experiment in submarine signaling has just been completed in the waters of Boston harbor near Boston light. In a little cottage at Point Allerton is an electric generator operated by a 2½-H. P. oil engine. From the cottage a submarine cable has been laid to the shore and thence 2¼ miles out into the harbor. At the end of the cable is an iron tripod, standing on the bottom of the ocean 70 ft. below the surface of the water; and on the tripod is a bell weighing 220 lbs., the clapper of which is actuated by powerful magnets. On March 30 last the current was turned on and the bell began to strike, at the rate of about 22 blows a minute. Since that date the bell has been in operation almost continuously. On May 23, when the total number of strokes reached 1,032,930 the endurance test was completed. The actual number of hours consumed was 789½. During that period neither the cable nor the bell required overhauling or any attention whatever.

Captain Snow, of the Boston lightship, reported that he heared the ringing of the Point Allerton bell in his cabin, the sound traveling through the five miles of water and coming into the ship. Tests made with regular submarine receiving apparatus showed that the bell sound was as clear, distinct and musical at six miles as at three; and that the electric bell is equal to the pneumatic bell for submarine signaling purposes.

Eleven of these electric bells are now being manufactured. Two bells are installed at each station, every portion of the apparatus being in duplicate, as is the rule in government work. The Canadian government has put in one station at Halifax and is equipping others at St. John, Louisberg and Yarmouth. The distance from the shore varies from two to ten miles. By arrangement with the lighthouse board, the first electric station in the United States will be located at Detour, at the mouth of St. Mary's river, through which steam vessels enter Lake Superior. The fog whistle at this point is more than usually uncertain and misleading. Later six other "turning points" on Lakes Superior, Huron and Michigan will be equipped.

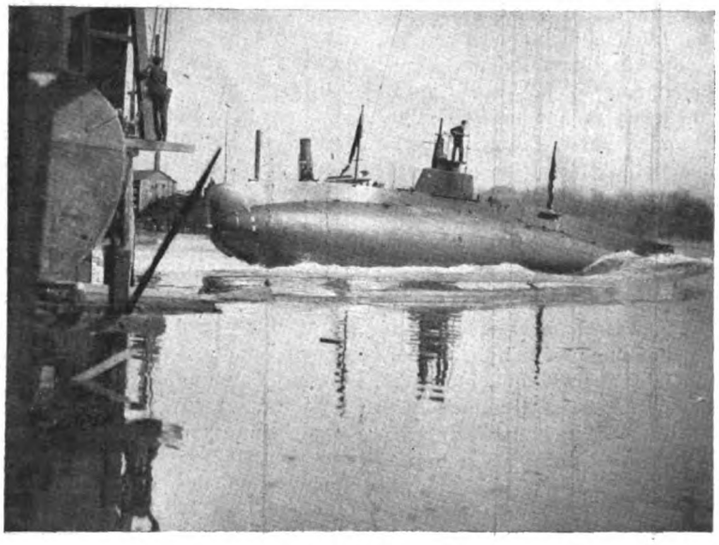
The eleventh bell goes to the Fall river steamer Priscilla, where it will be placed in the fore-peak of the vessel, under 5 ft. of water, and will be used to signal to the other boats of that fleet which are equipped with receiving apparatus.

The electric bell now in use was designed by Edward C. Wood, of Somerville, the master mechanic of the Submarine Signal Co., of Boston.

There has recently been inaugurated a steamship service between Seattle and North China ports, Messrs. Frank Waterhouse & Co. and Andrew Weir & Co. having begun jointly the operation of the new line, using six steamships carrying from 5,500 tons to 12,000 tons, of the latest types of ocean freighters. A regular service between Puget Sound ports, British Columbia and Hakodate, Vladivostock, Dalny, Chefoo, Taku Bar and Newchwang, is operated, calling at Chemulpo, Chinampo and other Korean ports, when inducements warrant the dispatching of the vessels there.

SUBMARINE TRIALS.

The tests of the submarine boats Lake and Octopus, built by the Lake Torpedo Boat Co., Bridgeport, Conn., and the Electric Boat Co., New York, respectively, began May 1.



SUBMARINE BOAT VIPER.

The special trial board consisted of Capt. Adolph Marix, Naval Constr. D. W. Taylor, Comdr. Burns T. Walling, Lieut. Comdr. W. S. Smith, Lieut. John W. Timmons and Ensign F. H. Sadler, U. S. N.

The tests were announced to be comparative rather than competitive and there were no races between the boats, each being tested independently. The first test of the Octopus, scheduled for May 1, had to be abandoned owing to the breaking of a bracket on her port engine as she was about to start.

The Lake underwent her trial on May 2 very successfully. The conditions imposed were that the boat should make three surface runs under both her motors and her gasoline engines and three runs under her gasoline engines alone. Her unofficial time is given as 8 6-10 knots an hour. Under the gasoline engines alone she made 7.68 knots, a reduction of scarcely one knot. It is probable that the tidal corrections will give the Lake an even better record, as for some time she faced a strong current and part of the time encountered a choppy sea.

The Lake made the upper line of the course at the rate of 8.26 knots. Running back with the tide against her and the sea rough she made a fine run, at the rate of 9.16 knots an hour. The average of these two runs was a rate of 8.71 knots. The run up the course again was against the wind, but with a little tide favoring the boat, and was made at the rate of 7.83 knots. The average speed for the run down and up the course was 8.49 knots. This completed the test of the boat at maximum speed under both her motors and gasoline engines, and the average rate was found to be 8.6 knots an hour.

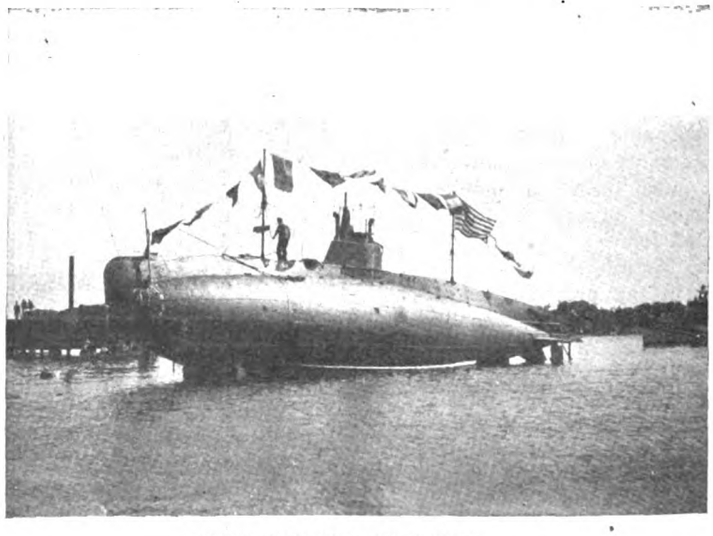
In the test under gasoline engines alone the conditions of wind and sea were improved and the Lake made her best speed of the day on the third run down the bay, wind and tide being with her. This run was at the rate of 9.18 knots an hour. Her first run under engines was at the rate of 8.63 knots, her second one, against both wind and tide, being the slowest, at the rate of 6.45 knots; the average of these two runs down and up the course was 7.54 knots. The mean average speed for the three runs with gasoline engines alone was 7.68 knots. Five more runs under the gasoline engines alone were made at gradually reduced speeds to enable the board to make a speed curve from which to figure exact deductions.

On May 7 the Lake was subjected to five hours of severe tests for speed while in the semi-submerged or awash condition, and for habitability. The result of this test is given as 7.492 knots (unofficial). The Lake was given seven runs over the course for speed, four being at gradually reduced speeds. The best time was made on the second run when the boat covered the course at a speed of 7.73 knots. During all the runs both the gasoline engines and electric motors were used, and at the end of the last run the boat made a dive of 10 ft. with the gasoline engines still running. After the Lake had been sealed for three hours the board made an examination of the air and it was found to be healthy.

The Lake's speed was better than her inventor had claimed and the fact that the Octopus has beaten her in the matter of speed is only in accordance with the previously expressed opinion of the inventor of the Lake, he contending that the superiority of the Octopus in the matter of speed is more than counterbalanced by advantages in the Lake.

The maximum speed of the Lake was 9.18 knots and the mean speed 8.6 knots.

In the first trial of the Octopus on May 3, she broke two speed records. In covering the government measured mile course three times the boat achieved an average speed of 11 knots under gasoline engines only. In addition to the surface tests the Octopus was given a series of trials in the semi-submerged condition and made 10 knots with only her electric motors in use.



SUBMARINE BOAT CUTTLESHIP.

The speed for the first run when calculated was found to be at the rate of 11.6 knots per hour. Going both down

and up the course, against and with the tide, she was found to have made 10.78 knots per hour. Her mean speed for three runs made as required at maximum speed was a small fraction over 11 knots. In another exhibition in semi-submerged or awash condition the Octopus attained a maximum speed of 9.98 knots. In order to enable the board to prepare her speed curve the boat made a series of surface runs at gradually reduced speeds.

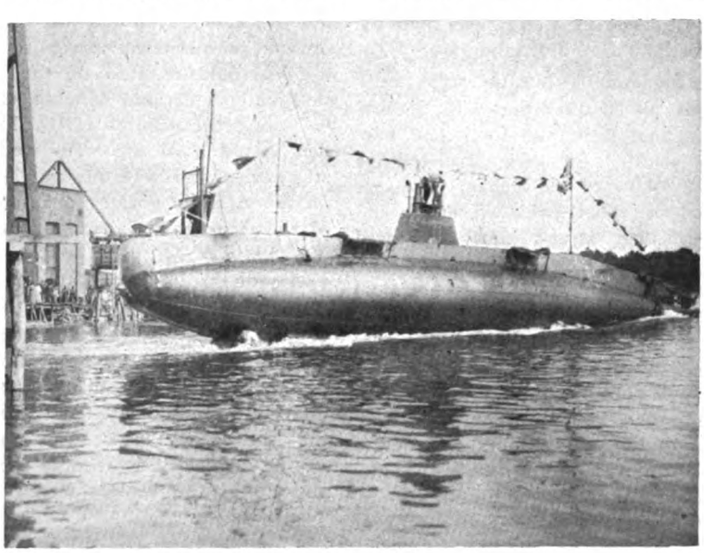
In the first run awash, which was down the course, the Octopus had the tide in her favor, used only her electric motors and attained a speed of 11.05 knots. Up the course, against the tide, her speed was 8.97 knots, the mean for this round trip being just about 10 knots. Going down again with the tide the Octopus made the run at the rate of 10.94 knots, which was surprising, as her owners had only claimed 10.5 knots for her in cruising trim.

The second test of the Octopus occurred on May 8 and it is claimed that in this trial she made a world's record by attaining a speed of more than 10 knots under water.

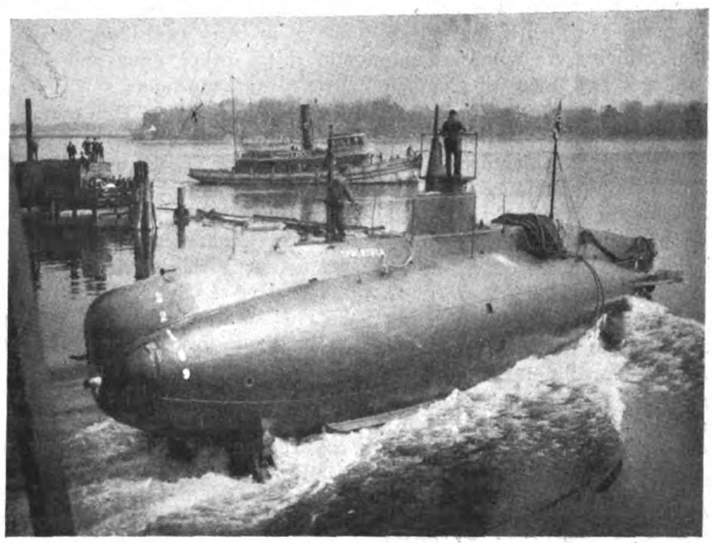
Three high-speed runs were made under water, the first mile being covered at the rate of 10.15 knots; this was her maximum speed, the average being 10 knots plus, a trifle less than made on May 3, while running awash. The conditions specified that she was to be at least 10 ft. below the surface but must show three feet of mast above the water. The submerged tests were followed by maneuvering trials in which the Octopus acquitted herself with great honor. She went down at an eight-degree angle to a depth of 26 ft. in a fraction less than 40 seconds. She then returned to the surface in order that an observation of five seconds might be made from her conning tower, after which she made another dive and another broach under the same conditions and in the same time. The best previous record for such diving was 46 seconds, made by the submarine boat Fulton, which is of the same type as the Octopus.

An interesting feature of these tests was the use of submarine signal bells, one on the Octopus and one on the tender Starling, by which means communication was kept up while the boat was submerged.

Owing to the fact that the Lake had sprung a leak in her torpedo tubes her submerged trial was postponed until repairs could be made.



SUBMARINE BOAT OCTOPUS.



SUBMARINE BOAT TARANTULA.

Elmer L. Corthell of New York, has resigned as a member of the advisory board of state barge canal engineers.

ITEMS OF GENERAL INTEREST.

The Robert Dollar Co., lumber and shipping, announces the removal and permanent location at No. 24 Market street, San Francisco, Cal.

The steamer City of Hudson, of the Catskill Evening line, recently ran on the rocks during a high wind, and considerably damaged her wheel house.

The Suez canal committee recently withdrew the regulations prohibiting the passage through the canal of tank steamers carrying benzine or petrol in bulk.

The Hamburg-American line is reported to have plans ready for two 800-ft. 25-knot steamers, designed to equal in size and speed the new Cunarders.

The Canadian Pacific railway steamer Princess Victoria, which ran on Lewis rock in December, has been repaired and is again running on the Vancouver-Victoria route.

The steamer Itasca, of the Merchants' & Miners' fleet, recently lost her tail-end shaft while bound out from Savannah and has been docked at Skinners' yard, Baltimore, Md.

The Pittsburg & Erie Coal Co. has purchased the steamers Philip D. Armour, John Plankinton, Wiley M. Egan and R. P. Fitzgerald from Arthur C. Helm, of Chicago, Ill.

The Hamburg-American Steam Packet Co. will use a part of the Woermann line fleet, which it recently purchased for $1,250,000, to establish a new African service.

The steam yacht Venture, owned by Mr. C. E. Simmons, of Nyack, N. Y., is now lying at the John P. Smith Co.'s ship yard awaiting the arrival of her new Roberts' safety water tube boiler.

A new enterprise in the small boat

building line has been started by Hopper & Foster at Tacoma, Wash. They are enjoying their share of the work that all builders of these craft are getting in that region.

The battleship Kansas was recently placed in commission with appropriate ceremonies, which were witnessed only by the officers and crew of the ship and the officials of the navy yard at Philadelphia.

The steamship President, built by the New York Ship Building Co., Camden, N. J., for the Pacific Coast Steamship Co., has completed her voyage around the horn successfully. She left Camden on March 22.

The battleship Olympia which was Admiral Dewey's flagship, is being fitted at the Norfolk navy yard as a training school for the midshipmen at the Annapolis naval academy. The changes will cost $60,000.

It is reported that the Great Eastern railway has placed an order with Messrs. John Brown & Co., Ltd., Clydesbank, Scotland, for a turbine steamer to replace the Berlin which was recently lost at the Hook of Holland.

The steamer Greyhound, of the Tacoma-Olympia Navigation Co.'s fleet, has been laid up in order that she may be fitted with oil-burning apparatus. It is probable that the steamer Multnomah will also be fitted with oil burners.

The American-Hawaiian Steamship Co.'s new steamer Columbian was launched from the yard of the Union Iron Works April 10. She is a sister to the Mexican, described in the April Engineering number of the MARINE REVIEW.

The ocean-going torpedo-boat destroyer Afridi was launched at the Elswick yards last week. She is the first of a new type of 800-ton destroyers, is 255 ft. long and, according to the contract, must develop a speed of thirty-three knots on oil fuel.

The Ohio river packet service is about to undergo a merger, the combine including the lines operating on the Ohio above Cincinnati and the boats engaged in freight traffic on the Kanawha, Muskingum and Monongahela rivers.

The Union Iron Works has wired the navy department to take over the unfinished armored cruisers California and South Dakota, owing to the strike which has made it impossible to complete the ships. The cruisers are, however, structurally complete.

The first-class armored cruisen Defence, built by the British admiralty at the Pembroke dock yard, was launched April 27. The vessel, which is of the Minotaur class, has a displacement of 14,600 tons and is expected to steam 23 knots an hour.

A new Italian battleship, the Roma, was launched recently from the yards at Spezia. She is of 12,625 tons displacement and a speed of 22 knots. She is to carry two 12-in., twelve 8-in., and thirty other guns and four submerged torpedo-tubes.

The United States Transportation Co. has recently inaugurated a new service between New York and Fall River, Mass., which is to be known as the Neptune line, with daily sailings. The steamers Connecticut and Rhode Island are to run in this service.

The Messrs. Swan, Hunter & Wigham Richardson, Wallsend, are reported to be about to build another fast passenger steamer for French Shipping Chargeurs Reunis. The vessel is to be on the same lines as the two now under construction for this company at the same yard.

The French navy is to be increased by the addition of six destroyers, the contracts for which have been let to private firms. They are to be larger than those previously constructed, having a displacement of 400 tons, against a previous 330 tons, and will cost about $400,000 each.

The Bay Shore Lumber Co., of Brunswick, Me., has sold the tug Pejepscot, which has been in commission only about three weeks, to the Sacadahoc Towage Co., which is said to be practically a subsidiary of the former company. The Pejepscot was built by the Portland Co., Portland, Me.

The London & Northwestern railway has placed an order with Messrs. Vickers Sons & Maxim for a new passenger steamer for their Irish service between Holyhead and Dublin. The vessel will be about 300 ft. in length and will have twin screws equal to a speed of 20 knots an hour.

The bar at the entrance to the port of Coatszacoalcos, the eastern terminus of the Tehuantepec railway, has been dredged to the depth of 24 ft. and work will continue until a depth of 30 ft. has been gained. The American-Hawaiian line of steamers operates in connection with the railroad.

The Mallory Steamship Co. has inaugurated an increased service between New York and Galveston, Tex., there being now three sailings weekly instead of two as heretofore. This line operates between New York and Brunswick, Ga., Key West, Fla., Mobile, Ala., and Galveston, Tex.

Oil plants have already been installed at Lime point, Point Bonita, and San Luis Obispo. The stations at Point New Year and Point Sur will soon be similarly equipped. It is quite probable that most, if not all, the fog signals in the twelfth lighthouse district will be equipped with crude oil burners.

The German Reichstag recently passed the first reading of a bill to authorize the expenditure of $3,750,000 as the first installment of the amount to be expended on the widening and deepening of the Kiel canal. It is proposed to expend altogether $55,750,000 on the reconstruction of the canal.

The Canadian Pacific railway has been reported to have under consideration the construction of another steamer similar in size and speed to the Pacific coast steamer Princess Royal now under construction at Vancouver, B. C. The construction of the latter has been greatly delayed by strikes and other local causes.

The Osaka Shosen Kaisha, a Japanese steamship company, intends to build two new steamers of about 10,000 tons each with a view to opening a regular service between America and Japan. The result of the workings of this company for the latter half-year of 1906 was unsatisfactory and no dividend will be paid for the period.

Smith & Robinson, Philadelphia, naval architects and engineers, have contracted with the Pennsylvania Railroad to build two grain barges of 30,000 bu. capacity each. They will be 150 ft. long, 25 ft. beam and 13 ft. deep. The barges will be built at the shipyard of John H. Mathis & Co., Cooper's Point, Camden, N. J.

The wreck of the large new pier of the B. & O. railroad at Baltimore caused an immense wave to sweep to the opposite side of the harbor, causing considerable damage, especially among the smaller craft. The new pier would have accommodated seven steamships and was one of the finest on the Atlantic coast. The rebuilding of the structure is already under way.

A number of obsolete British war vessels were recently sold at auction at Chatham dock yard including such vessels as the third-class armored battleship Conqueror, first-class armored cruiser Undaunted, torpedo gunboat Alarm, torpedo boat destroyer Kate, and the yacht Wave. The conditions of the admiralty as regards the breaking up of the vessels were very explicit.

A number of Italian naval vessels are to be sold or broken up during the next five years, the list comprising 21 ships of various classes, including the Duilio (launched in 1877) and the Andrea Doria (launched in 1891), as well as 51 torpedo boats. With the proceeds, which are estimated at over $1,000,000, the Italian government intends to make large purchases of coal for its navy.

The German government has decided to deepen and widen the Kaiser Wilhelm canal, which connects the North Sea with the Baltic. The work will take ten years to complete and will cost ten millions sterling. The existing canal was opened in 1895. Its greatest surface depth is only about 190 ft. and its bed breadth only about 70 ft. Its largest locks are only 470 ft. long, 80 ft. broad and 30 ft. deep.

The old navy frigate Saratoga, which has been used as a school-ship, is now doomed to the scrap-heap. She was recently examined at the League Island navy yard, with a view to being overhauled, but when the carpenters began an investigation it was found that she was beyond repair. The Saratoga was the first ship commanded by Admiral Farragut after he received his commission as a captain of the United States navy.

The British naval torpedo-boat destroyer Cossack was launched recently by Cammell, Laird & Co., Ltd., Birkenhead. The vessel is 270 ft. long, 26 ft. wide and 15 ft. 5 in. deep, and will be propelled by turbine machinery of the Parsons type. She is designed to attain a speed of 33 knots per hour, which will be the highest ever accomplished, although the same company is building the Swift, which is expected to accomplish a speed of 36 knots an hour.

Several large trans-Atlantic liners were recently fast in the vast ice fields in Cabot Strait, between Newfoundland and Cape Breton. The Allan liners Vancouver and Ontarian and probably the Dominion liner Vancouver were included, together with the Ottawa and the British mail steamer Virginian. The Ottawa and the Ionian later reached Montreal but a change in the wind piled up the ice again and the conditions were again as bad as ever.

Peter Wright & Sons, agents for the Cosmopolitan line, will begin the operation of a new line of steamers next fall, between Philadelphia and Havre, Dunkirk and Hamburg. The boats will compete with the Hamburg-American line and affiliated interests, which have recently invaded the territory of the Cosmopolitan line between Philadelphia and Rotterdam. First-class steamships will be chartered and a lower rate than that now quoted will be charged by the new line.

The White Star liner Suevic, which ran on the rocks at the Lizard, has been salved by the wreckers blasting off her bow with dynamite. She was so firmly wedged for practically one-fourth her length upon the reef that no means of release were practical other than that of literally blowing the steamer in two. This task was skillfully accomplished by the wreckers and the Suevic was then towed to Southampton for repairs.

The Chicago office of the Standard Oil Co. will be removed to 115 Adam street after May 27.

No award of contracts for the construction of submarine torpedo boats has been made as yet in accordance with the bids opened by the department on April 30. The board is awaiting receipt of report upon the results of tests of subsurface and submarine boats now in progress under the provisions of the naval appropriation act of June 29, 1906.

The American-Hawaiian Steamship Co.'s big liner Mexican has just made a very satisfactory and successful trial run in San Francisco bay. Under command of Capt. Charles Nichols, the Mexican will go into active commission at once for her owners and will henceforth ply on the route connecting San Francisco with Puget Sound, Honolulu and Salina Cruz on the Isthmus of Tehuantepec. She is a sister vessel to the Columbian and Isthmian, both of which are under construction.

The plans for the new works of Messrs. Harland & Wolf, the Belfast ship builders, which they are to erect at Southampton, have recently been passed upon and the enterprise is now assured. The works will consist of a large engineering shop and repair shop. While this means a serious loss to Belfast in wages and material, Southampton is correspondingly pleased. A suitable site will at once be secured. The firm will expend in the neighborhood of $1,250,000 in the erection of the new plant.

The side-wheel passenger steamer Orient, owned by the Montauk Steamship Co., recently became completely disabled while en route from Greenport, L. I., to New London, Conn., owing to the breaking of her shaft. Her distress signals were noticed by the wireless station at Plum Island and aid was sent, the towboat Harriett and the government transport steamer Gen. Nathaniel Greene responding. The latter took the passengers to New London and the former towed the disabled vessel into port.

Lumbermen in the Teche district of the Mississippi have subscribed $150,000 for the general improvement of the Atchafalaya river and will shortly add $50,000 to the fund. The river will be widened and deepened until it is capable of floating the largest barges engaged in the transportation of lumber. The project of starting a competitive barge line on the Mississippi has been under consideration by the lumbermen for several months, and action was only deferred through promises of the railroads to furnish greater transportation facilities.

The steamship agents of the trans-Atlantic lines at New York are not optimistic regarding the amount of immigrant business to be expected for the year, although there is no alarming falling off as yet. There is, however, a decidedly greater movement of the laboring classes outward than is at all usual at this time of year, which is ascribed to the fact that there is a general industrial let-up in progress, in which the railroads have figured largely, many projects having been given up and a general policy of retrenchment being much in evidence.

The British cabinet is said to be seriously considering a suggestion given by Sir Wilfrid Laurier, the Canadian premier, to the effect that the government, without violating its free trade principles, might give the colonies a quid pro quo for their preferential treatment of British goods by subsidizing steamship lines between England and the more important colonies. The object of the suggestion is to bring about a reduction in freight charges, thus giving an indirect form of preference to the colonies. The premier especially suggested subsidized lines between England and Canada and Canada and Australasia, reducing the time from England to Australia to twenty instead of thirty days, and in the end diverting some of the traffic now going by way of New York.

The Japanese government is reported to have under consideration an ambitious scheme for the improvement and extension of harbors. The intentions respecting the harbor works at Kobe will probably be of the greatest importance, as Kobe has already attained to the position of the center of the North Asiatic shipping trade. It is said that no later than June the government intends to commence the construction of extensive quays at Onohama, and on the Hiogo side spacious anchorage grounds are to be provided. This part of the whole scheme will entail the making of a mole, a pier, a landing stage, storehouses and sheds, 22 miles of railway, and 130 cranes. At Hiogo three wharves are projected, as well as large storehouses, three miles of railway, and eight cranes. New streets are also to be made here, and electric light installed, the cost of the whole being estimated at 32,490,000 yen, and the time necessary for carrying out the works is eight years. Equally extensive plans for the improvement of Hokkaido are said to have already arrived at a concrete state, the work being calculated to cost 20,400,000 yen.

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TO BENEFIT WHEELSMEN AND WATCHMEN.

As an encouragement and with the view of bettering the condition of the wheelsmen and watchmen on lake boats, the MARINE REVIEW opens this week a course of self-instruction in the rudiments of practical seamanship and navigation for their express benefit.

Every wheelsman and watchman having the interest of his work at heart, has an ambition to become a second officer, and then a first officer. If he has not he should have, for a man without ambition is no man at all.

Many men filling the berths of wheelsmen and watchmen are intelligent and industrious, and are looking forward to the time when they can better themselves, but they are kept back simply because they do not know how to proceed in laying the right kind of a foundation to build the required knowledge on. It will be the object of this department to discuss only those subjects that are essential to a full understanding of the questions given by the various government examining boards on the lakes. The method to be adopted will be simply this: A list of 10 questions will be printed weekly, and when all the questions relating to the same subject have been exhausted the answers to same will be published either in full or in installments. The student to get the most benefit from the work should study the questions and dig out the answers to the best of his ability. He should write his answers in full and in advance of the time of printing the answers. When the answers are printed he should compare his answers with the correct ones. In this manner he can correct his own work, as well as that of a teacher. If the student will follow closely this advice and the instructions that are to accompany each lesson, he will be surprised at the progress he will be able to make, and it will be real progress, too.

A question and answer column will also be conducted in conjunction with this department. This will enable the interested ones to ask as many questions as they like on the work. There will, of course, be times when additional information on certain questions will be required in addition to that contained in the text. Its discussion may take place in this column.

It is the MARINE REVIEW'S earnest desire to help and it trusts that a majority of the wheelsmen and watchmen on the lakes will enter into the work with the right spirit. The MARINE REVIEW has been assured time and time again by vessel owners and their managers that there is a growing demand for competent men aboard their ships. They want men who are navigators, as well as first-class pilots and seamen. There are many excellent opportunities for the right kind of men on the lakes. The chances of promotion on board ship today are better than ever before. But one's promotion depends on his own efforts, and to be successful he must be a navigator—a navigator of extraordinary ability in relation to the compass—and this can be brought about only by careful study of the theories and fundamental principles of navigation. Navigation is purely a book study and the man that is willing to learn can do so by following the MARINE REVIEW'S course of instruction.

COLONIAL SUBSIDIES.

The Dominion government is endeavoring to interest Great Britain in an all British route from England to Australia and New Zealand by way of Canada under heavy governmental subsidy. The Dominion desires the Imperial government to devote money to assist the lines running to Canada and the other colonies. It has been suggested to Great Britain, that instead of subsidizing the lines now running to New York, the money be diverted to a Canadian service. It is understood that Canada is willing to grant an annual subsidy of $1,000,000 for a 20-knot Atlantic service in conjunction with fast trains across the continent. New Zealand is willing to pay a subsidy of $500,000 per annum and Australia probably an equal if not greater amount. These are liberal sums and prove colonial determination to keep their trade within themselves.

It is very curious indeed that the United States can watch other nations build up their foreign trade through the judicious expenditures of money to steamship lines and yet be fearful of following a like example. If the United States had subsidized its steamers as generously as Great Britain did when steam navigation became commercially possible, it would not today be in the pitiful condition that it is. The merchant marine of the United States in the foreign trade is growing less each year. It has practically disappeared from the Pacific ocean. By force of circumstances it will shortly disappear from the western ocean also unless congress removes the handicap under which it now operates. The American ship cannot live on the high seas without governmental assistance. Flatly, it is in need of a subsidy to overcome the artificial handicaps which have been placed upon it.

FREIGHT SITUATION.

The movement of ore while by no means smooth as yet, is steadily improving, and by June 1 vessels will have delivered about 5,000,000 tons of ore. Ore is reaching Lake Erie docks now quite as fast, if not faster, than the docks can handle it. Railways have not been able to supply sufficient cars to care for the trade so that considerable amounts are going on dock. Carriers, in fact, are rather badly bunched at lower lake ports at present, the harbor of Cleveland especially being crowded with them.

Coal is moving freely, but shippers have been compelled to pay an advance, especially to out-of-the-way ports. The coal rate at present to Milwaukee on small cargoes is 50 cents, which is an advance of 10 cents over the contract rate. Cargoes are also offered freely to Lake Superior at 35 cents, which is an advance of 5 cents over the contract rate. The movement of coal up to the present time is probably the heaviest ever known as it has employed a great many large carriers. The grain rate is unchanged though the demand is dropping off.

The ship yard strike, which has spread its length over the past several weeks, will probably fall of its own weight this week. The men at the Ecorse and St. Clair yards of the Great Lakes Engineering Works have returned to work and several gangs of riveters have also resumed operations at the Lorain yard of the American Ship Building Co. The ship building companies have not receded from their original positions and the men have accomplished nothing except the depletion of the reserve fund.

IRON SITUATION.

Outside of Pittsburg and in the east the pig iron market has not been as active in the past week as during the two or three weeks preceding. Producers are showing strong conservatism and neither sellers nor buyers are anxious to crowd the market at this time. In finished lines new business is not of great volume, but specifications are heavy. Rail sales of the week were about 70,000 tons in Chicago and about 12,000 in the Pittsburg districts respectively. Considerable buying of steel bars by implement manufacturers was in evidence. Bar iron continues to show weakness, and structural is a little behind in finished lines. Following the announcement made two weeks ago of advances in prices of engines, it is reported that boiler manufacturers are taking similar action, due to high prices demanded for plates for prompt delivery and to increased labor costs. Some independent mills are now receiving $40 per ton for tank plates, and last half contracts are being freely made at $38. Coke is weak and old material remains irregular.

STEAMER NAOMI BURNED.

The steamer Naomi, of the Crosby Transportation Co.'s fleet, was burned while enroute from Grand Haven to Milwaukee on Monday night. One passenger, J. M. Rhoades, of Detroit, and four coal passers were burned to death. Rhoades was terribly burned in his berth and died shortly after reaching the hospital at Grand Rapids. The four coal passers were penned in the forecastle and perished before help could be given them. The fire on the Naomi broke out about 1:30 a. m. between decks in the forward end of the steamer. It must have spread with great rapidity as the passengers had scarcely time to get their clothing. The flames were seen by the steel freighter D. G. Kerr, the Kansas, a sister to the Naomi, and the Saxonia. While these steamers were racing to the burning craft the life rafts and boats of the Naomi were lowered. Splendid discipline appears to have been manifested by the crew as every care was taken of the passengers, many of whom were aroused from sleep by members of the crew at great personal hazard. Capt. Ballentine, of the Kerr, was especially commended for the manner in which he maneuvered the freighter, holding her steel bow against the side of the Naomi until the last passenger had climbed aboard. The Naomi was formerly the Wisconsin. She was built by the Detroit Dry Dock Co. in 1895 and was 204 ft. long, 35 ft. beam and 22 ft. deep. She underwent extensive alterations when placed in the passenger and freight trade on Lake Michigan.

SAFETY IN WATER TRANSPORTATION.

Editor MARINE REVIEW:—I notice that there is a movement on foot in New York in the interest of greater safety in water transportation. While it is always commendable to endeavor by every means possible to reduce the hazard surrounding water transportation, and especially in the direction of safety to life, it certainly seems to me that there is a greater field in any other direction for devising means for greater safety of life wherever people are moving on foot or being transported from one place to another on shore by whatever method known.

According to United States Supervising Inspector-General Uhler's annual report ending June 30, 1905, out of a total of 600,000,000 passengers carried on waters coming under the U. S. Steamboat Inspection Service, one life was lost out of every 2,390,438.

During the fiscal year ending June 30, 1906, owing to the stranding of the steamer Valentia on Vancover's Island with a loss of 121 lives and the unprecedented number of casualties on Lake Superior during that fiscal year the loss of life was increased to one out of every 1,796,000 people carried. Assuming this report to be correct we would naturally turn our attention shoreward in the protection of life and limb.

I understand that Attorney Harvey Goulder is endeavoring to gather statistics of casualties resulting in the loss of life on shore which when completed and placed before the people will no doubt be of deep interest to the traveling public as well as to all others concerned and almost make one experience a sense of insecurity by remaining on shore.

Quoting from General Uhler's report: "The conclusion is abundantly justified that the lives of the passengers and crews of vessels under the jurisdiction of this service are being carefully safeguarded and protected, and that the Steamboat Inspection Service is fulfilling the purposes of its organization." However while even greater efficiency is possible every suggestion for the betterment of conditions should be carefully considered and if found of value adopted.

Respectfully yours,

JAMES STONE.

Cleveland, May 21.

The steamer Minnie E. Kelton has just been fitted for salt water service by the installation of new shafts, brass-covered, two new propellers, new steering bearing and a lead sleeve, new independent Wheeler surface condenser and circulating pump by the Sheriffs Mfg. Co., Milwaukee, Wis. She left Milwaukee on her trip to the coast last Wednesday morning. The Kelton is one of the two steamers purchased by Ganahl & Co., of San Francisco.

Capt. James Davidson, of Bay City, this week purchased the tug Willie Brown and the sand sucker Fletcher for $3,900 at an auction sale conducted at Saginaw.

LAKE UNDERWRITING.

Buffalo, May 21.—The lake underwriters are not feeling very pleasant just now. They see their losses piling up from all sources and are helpless to prevent any of it though the ice loss would be mostly preventable if the underwriters had the requisite nerve and stamina to forbid vessels from plunging into an ice field, as they are doing right along every spring. A month ago there were steamers going outside here by the dozen when there had been others in the ice for days, unable to move.

The dry docks here are still very busy with the vessels that have had a tussle with the ice and have come out the worse for it. The last report was that the docks were full of craft that had mostly bottom work to be done, for there have been a good many strandings along with the ice damage. Besides some very heavy losses have resulted from collisions and these have a bad way of creating cargo as well as hull losses, as with the Gault-Whittaker case. When there is a full quota of fire losses the list will be complete, though there have not been any total losses yet.

The underwriters say that they are not really bound to stand the average ice losses, for the captain who deliberately goes to bucking ice is not exercising "due caution" by a long way. Then why do not the underwriters set a firm foot down and stop it all? The answer is that they do not quite dare to undertake it. But how does anyone know that there is a lack of due precaution? Because if there was no insurance forthcoming to meet ice damage the vessels would stay out of the ice, is the quick reply. The owner is not going to do anything of the sort on his own risk.

Of course there have been unusually heavy ice losses this spring that cannot be met by insurance. Some of the larger vessels have lain for weeks waiting for the ice to move out of the way and besides, as an underwriter notes, there is always much loss from the time a vessel must lie in dry dock repairing. This is not taken into proper account, it is claimed. A vessel owner is proverbially the most uneasy person living when there is a possibility of getting the fleet started, even iron-clad agreements to start on certain days not always saving him from the fever. Sometimes there is cargo that should be delivered in April, sometimes there is chance of a lull after the first round trip and there will be trouble if it is not made early. So the attack is made on the ice usually before it is soft enough to navigate safely.

A Buffalo lake underwriter estimates that the insurance loss from ice damage already incurred this spring will not be less than $500,000, though he admits that any estimate must be a wild guess as yet, and then he refers ruefully to the fleet still stuck fast in the ice at Fort William and the reports of ice accumulations above the Sault and wonders if his figures are to be added to very much yet this spring.

As it looks now the insurance companies doing business on the lakes are already pretty nearly past all possibility of making a profit this season, for if the elements were to turn in their favor as they once in awhile do there are always so many things to pay for that cannot be laid to stress of weather that it is not easy to catch up when the losses are away ahead of the earned premiums. It is true that the premiums will be larger than they were last season. The rate is a fraction higher and the higher tonnage valuation with the cutting off of minor losses will all contribute to the earnings of the insurance companies, but it seems certain that it will all be needed and more with it to make up for the extra losses already in the list.

The slow conditions on the lakes seem to hang on as never before. Some big vessels have not made a round trip yet. Some of them were in the big rush of coal to the upper lakes and were hung up awhile there. The lumber fleet is still suffering more or less from not being able to get into certain Lake Superior ports after the lake in general was open. The new practice of loading large amounts of coal at Lake Erie ports during winter cuts down the amount offering to first arrivals and in case of hard coal obliges a great part of the regular coal carriers to go up next time light.

The tendency is to ship hard coal more and more to the three or four leading upper-lake ports. At the end of April the 400,000 tons of hard coal shipped from here had all but about 18 per cent been consigned to Chicago, Milwaukee and Duluth-Superior, with Chicago leading about as usual, spite of the comparative ease of making rail shipments there. When there is any desire to cover any lake port or to push forward through shipments east or west the united trunk lines make a very small showing as compared with what can be done by lake.

JOHN W. CHAMBERLIN.

NEW AZIMUTH TABLES FOR THE LAKES.

Announcement was recently made in these columns of the new azimuth tables for the great lakes, to be published by Frank Henrich, Master Mariner, Duluth, Minn. The publication has come from the press and is now on the market. It is a splendid work and merits a careful consideration on the part of every navigator, if not the owner and insurer. The convenient arrangement of the whole table reflects much credit on its painstaking author.

The object of this new publication is to eliminate, so far as possible, the tedious operations of interpolating for the intermediate minutes of apparent time, latitude and declination. The chief objection to the government azimuth tables is the time interval of 10 minutes between the true bearing for every hour of the day, which necessitates almost constant interpolation, with consequent loss of time and liability of error. Captain Henrich, after a thorough examination of the government azimuth tables for use on the great lakes, was convinced that improvements were necessary, also that the immense maritime commerce on these inland seas, conveyed by means of modern constructed and equipped steel steamers, merited a special publication on this subject. In this opinion the author was sustained by a large number of progressive navigators. The work consisted of re-computing, re-arranging, and extending the existing azimuth tables for the latitudes 41 degrees to 49 degrees north. Numerous ship masters to whom the nature of the undertaking was explained were enthusiastic and urged its completion at the earliest possible moment.

The arrangement of the new tables is entirely novel and thoroughly original. Instead of the 10 minute intervals between the true bearings, 4 minute intervals are employed, and instead of the bearings being given for one latitude for the entire year for each even degree of declination, on a single page or two pages facing each other, as contained in the government tables, the true bearing for each even degree of latitude comprising the great lakes region is given on the same page for each even degree of declination. For example, if the true bearing of a celestial object be required for a p. m. hour angle of 1h. 8m. for any degree of latitude corresponding to any degree of declination, it will be found grouped on two single pages facing each other; the true bearing corresponding to each

even degree of declination being vertically under same, and the one hour angle standing for each degree of latitude, 49 degrees to 41 degrees, inclusively.

The new table will have to be carefully examined to be appreciated. The Hydrographic Office azimuth tables are for latitudes 40 to 50 degrees, while the new tables cover 41 to 49 degrees, these latitudes taking in the entire lake region.

The data in the government tables is for objects not having a greater declination than 23 degrees. In the new table the declination has been extended to 29 degrees, thus affording the observation of the moon and planets in their various positions, and of 88 of the 150 navigational stars.

The true bearings are given to the tenth part of a degree exact, which is sufficient for all practical purposes, and converts the labor of interpolation for time, declination and latitude, into a brief, and after short experience, mental process. The elements of latitude and declination are contained on the same page for 36 minutes of time, divided into nine epochs of 4 minutes each. The tables commence at 11 hours 56 minutes and continue till the rising or setting of the object. The government azimuths are given in degrees and minutes of arc. In the new tables all bearings decrease from the top toward the bottom of the page; this being on the assumption that the object is on the meridian as a starting point. The government tables start with the objects rising or setting. The azimuths for apparent noon have been excluded (the same as the government tables), for as every navigator is aware, the object is due south (true) at this moment, no matter what latitude or declination may be. The azimuths are augmented by two maps and numerous auxiliary tables, a proper description of which will be found under "Explanation and Use of the Tables." All parts of the tables are prominently exhibited before the student, by an abundant number of examples for practice, distributed over all parts of the lakes, by selecting the important objects on the celestial sphere, and covering all subjects related to azimuths. This renders the publication an excellent guide for self-instruction.

The author in his introductory says, among other things:

"Whatever has been said in enumerating the undesirable features of the government azimuth tables for lake navigation, it should be borne in mind that they have, and are doing loyal service, they hold the honor of being pioneers in the assistance of the navigator in his frequent task of observation. Before their appearance, it involved a lengthy and tedious computation to find the true bearings from altitudes of the bodies and chronometer. They have been freely used in the construction of this publication, in other words, they have been built upon, as it is to be hoped, that the present will be improved to serve future needs as they may occur, for, azimuth tables have come to stay, and as long as iron and steel enter into the construction of ships, the navigator cannot afford to be without them."

The sincere thanks of the author are due to Mr. Oscar Erickson, assistant to Branch Hydrographic Office, Duluth, who designed the first skeleton for the tables, for computation and general work. Also to that excellent seaman and navigator, the late Capt. Robt. Smith, for practical suggestions during the constructive period of the publication. Captains Hugh O. Miller, Neil Campbell, John F. Parke, C. J. Grant, C. D. Secord, J. P. Thompson and numerous others took active interest in the work.

The MARINE REVIEW takes pleasure in recommending this work to lake men, and heartily endorses the various statements made in the author's introductory. Owners should see that their boats are supplied with them and that they be used for the purpose intended.

AROUND THE GREAT LAKES.

The steamer Leland S. DeGraef will be launched at the Lorain yard of the American Ship Building Co. on June 1.

Fire broke out on the steamer Augustus B. Wolvin in Lake Erie last week, but was confined to the crew's bath-room.

Work on the improvement of the breakwater pier at Milwaukee will begin next month. The pier will be lengthened by 1,000 ft.

The Great Lakes Construction Co. will be given the contract for replacing 2,000 ft. of the breakwater at Buffalo which was washed away by the storm last January.

The Buffalo Dredging Co. and the Thomas Brown Dredging Co. were the lowest bidders for the work of straightening, improving and widening the Buffalo river.

President Wm. Livingstone of the Lake Carriers' Association received advices from Ottawa this week that the Canadian government has decided to build a lighthouse at Jackfish Bay.

The schooner S. B. Pomeroy which sprung a leak and went to the bottom at Lorain a week ago, has been pumped out by the sand sucker Charles Reitz and floated.

The steamer Caledonia was released from the Middle Ground by the Reid Wrecking Co., after lightering 500 tons of ore, which was later reloaded upon the steamer at Sarnia.

At a meeting of the stockholders of the Cleveland & Buffalo Transit Co. held on board the steamer City of Erie on Saturday afternoon last, it was decided to defer the building of the new steamer for the Cleveland & Buffalo route. It is not probable that contract for the construction of this steamer will be awarded during the present year.

The Canadian government will have charge of the movement of vessels at the Lime Kiln crossing until the rules proposed for this crossing are approved by the Canadian and United States governments. This was decided after a visit to the crossing by President Livingstone of the Lake Carriers' Association, Commander Spain of the Dominion government, Col. Charles E. L. B. Davis, United States engineer, and Harry Coulby, president of the Pittsburg Steamship Co. Capt. Frank H. Hackett of the tug Home Rule has been appointed by Commander Spain to direct the passage of vessels. Upbound vessels will be required to take the easterly channel and downbound vessels the westerly channel through the rock cut.

The Standard Contracting Co. of Cleveland has been awarded contract by the Pennsylvania Railroad to build a steel and timber dock on the site of the old Haskell dock just below the swing bridge at Ashtabula. The old Haskell dock was abandoned some years ago, owing to the fact that it was impossible for vessels to pass through. The new structure is not intended for commercial purposes, but merely as protection to the bank.

The steamer Saxon of the Pittsburg Steamship Co.'s fleet which stranded on Caribou Island in a fog was not badly injured. Her forepeak and forward compartment was full of water. Capt. W. W. Smith, marine superintendent of the Pittsburg Steamship Co., took charge of the operations of salving the Saxon with the lighter Rescue. After jettisoning part of her cargo the Saxon was released and proceeded to the lower lakes with her cargo of iron ore. She will be repaired at Toledo.

QUESTIONS FOR WHEELSMEN AND WATCHMEN.

The MARINE REVIEW, beginning with this issue, opens a course of simple navigation by the question and answer method. The first list of questions together with suggestions as to the best means of studying same, is appended herewith. The chief merit of this course will be that those who follow it will be educating themselves as practical deck on watch officers. All questions will be made as practical as they possibly can.

The average wheelsman and watchman is of the opinion that his position is not recognized and is too far removed from that of his superior officers to be of any account in the minds of the boat's owner or manager. This is a mistaken idea for the owner is no less interested in his welfare, taking into account, of course, the difference in their stations, as he is in those occupying higher positions. Wheelsmen and watchmen entertain this idea simply because their positions do not bring them in as close touch with the owner or manager as do that of the officers. Nevertheless, the average owner is interested in his wheelsmen and watchmen, especially so if they are ambitious and are endeavoring to advance themselves. It stands to reason that he should be interested in them, for will he not be obliged, sooner or later, to draw from this same source men to officer his boats. The master and mates were wheelsmen and watchmen before they became officers, therefore, one is a natural outgrowth of the other. No owner is going to be slow in recognizing the higher qualifications of a man no matter what berth he may be filling on board his ship. It is to his interests to do so and he is doing it.

Owners want men on their boats who are thoroughly competent to perform all the duties necessary to insure the safety of the property intrusted to their care. They want men who are competent navigators in addition to being skillful pilots. They want men to sail their boats who are perfectly familiar with the compass under any and all conditions. These conditions are many and require book study. You cannot acquire this knowledge by simply being employed on a boat. This subject is within the reach of nearly everyone who is willing to devote his time to its study and there is no good reason why you should not make an effort in that direction. If you are going to be a lake sailor be the right kind. The MARINE REVIEW will lay the right foundation for you.

Owners and managers are awakening to the fact that the safety of their property depends as much on the navigational ability of the master in accurately directing the course of the vessel outside as it does in the skillful handling of craft in the rivers and other narrow channels. It is only natural then that owners are desirous of officering their boats by men who have this ability. The secret of successful sailing on the great lakes lies principally in this one thing.

The knowledge that the wheelsmen and watchmen will obtain in following this self-instructive course will be of great assistance to them in acquiring the desired information.

Another object of this special course is to bring the wheelsmen and watchmen in closer touch with the owner and manager, so that if there be any barrier between them this course should be the means of removing it. We want the wheelsmen and watchmen, as well as others, to ask as many questions in regard to their work as they would like. Do not be afraid that your question may be a foolish one. A good way to find out things is to ask all sorts of questions about them. It is to be hoped that this special course will meet with the hearty approval of MARINE REVIEW subscribers and readers. It is our aim to assist every man aboard ship.

Following is the first list of questions with suggestions:

It is assumed that the student is able to "box the compass." His first step then in the work is to acquaint himself with the *number* of each point; in other words, he should be able to "box the compass" by naming the number of the point instead of by the name of the point itself. For example, NNE is 2-points, that is, N 2-pts. E; N½E is ½-pt., that is, a ½-pt. course, and is of course, read N½E. NE½N is a 3½-pt. course and may be read N 3½-pts. E, and so on with the other points of the compass. North and South are always zero points on the compass, and all points are reckoned from these, towards east and west. By examining any compass card it will be readily and easily observed that similar or equal points are always the same number of points or quarter points from N. or S. For example, NNE, NNW, SSE and SSW are similar or equal points, since they lie the same number of points on either side of the meridian of the compass, north and south being thus called, or N. and S. represents the meridian of the compass. The 6-pt. courses are ENE, WNW, ESE and WSW; the 5-pt. courses are NE x E, NW x W, SE x E and SW x W; the 3-pt. courses are NE x N, NW x N, SE x S and SW x S; the 7-pt. courses are E x N, W x N, E x S and W x S. When we say a 6-pt. course we know at once that it must mean either ENE, WNW, ESE or WSW. It will also be observed that there are 4 of every kind of courses, except the 8-point courses, which are east and west, because they are 8 points from N or S. You must be careful not to reckon your courses from the east and west points. For example, you should not say that E x N, E x S, W x N or W x S are 1-pt. courses because they are 1-pt. from either east or west. These are 7-pt. courses because they are 7 points from the meridian of the compass. They are one point from east and west, but they cannot be called one point courses. Just bear this in mind. The young sailor should be as familiar with the number of points in each course as he should with its name. He should also be able to name instantly any such questions as these: "How many points is it from NNE to E x S? from S x W to WSW? from W½N to NW½W? from SE to S x W½W?" No one can claim familiarity with the compass who can not do this. It is essential to know this in determining the point of the compass a sailing vessel is heading on in thick weather by knowing the direction of the wind and the blasts of her fog horn. For example, supposing the wind is North, and you hear a sailing vessel blowing *one* blast of her fog horn; in which direction is the vessel proceeding?

When a sailing vessel blows one blast of her horn in fog it denotes that she is on the starboard tack with the wind forward of the beam. A sailing vessel is on the starboard tack when the wind comes over her starboard side and her sails belly out to port. A sailing vessel will lie from 5 to 6 points from the direction of the wind when beating to windward; hence, if we count to the *left* from the direction of the wind 5 to 6 points we will at once determine the approximate direction the vessel is steering in. Knowing this on board a steamer the steamer can at once determine the direction and amount that she must shift her course to go clear of the sailing vessel. Remember that a steam vessel must always keep clear of a sailing vessel when both are under way and both are manageable. Example, supposing a vessel lies 5 points from the wind, how will she head close-hauled on the starboard tack with the wind north? We simply count 5 points to the left of N, and 5 points to the left of N is NW x W, hence, the vessel is heading about NW x W.

A sailing vessel is on the port tack when the wind comes over the port side and the sails belly out to starboard. In thick weather a vessel on the port tack beating to windward, wind anywhere

forward of abeam, blows 2 blasts of her fog horn, and this signal denotes the direction according to the wind she is proceeding in, that is, the approximate direction. All boats do not sail as close to the wind. According to the law the wind may be anything forward of abeam, so that we must be guided accordingly. To get the direction a vessel is proceeding in when she blows 2 blasts we merely count 5 or 6 points to the right from the direction of the wind. Example, a sailing vessel lies 5½ points from the wind when close-hauled, she is blowing 2 blasts with the wind N, in what direction is she proceeding? Counting 5½ points to the right of N brings us to NE x E½E, the direction of the vessel's head. When a sailing vessel is running free, which means that she may have the wind anywhere abaft the beam, she denotes it in thick weather by blowing 3 blasts of her fog horn.

Study out the following questions and write the answers, preserving them so that you may compare them with the published answers:

1. If a vessel is steering north, what point on the compass is 2 points forward of the port beam?
2. If a vessel is heading NE, what point of the compass is 4 points from her head on the starboard bow?
3. If a vessel heads WSW, what direction is her stern in?
4. If a vessel is steering NW½N, what point of the compass has she ahead?
5. How many points is it from N½E to E½S?
6. If a vessel is steering NNW and an object bore W x N, how many points is it from her head, and on which side of the ship?
7. If you were steering E x S, what point on the compass would be on your starboard beam?
8. If your boat is heading SSW, what point on the compass would be 5 points from her head on the port side?
9. How many 4-point courses are there, and what are their names?
10. How many points is it from S¼E to S x W¼W?
11. When is a sailing vessel on the starboard tack?
12. A sailing vessel is lying 5 points from the wind on the starboard tack and is heading NE x N, what is the direction of the wind, and how will she head close-hauled on the port tack?

AT HEAD OF THE LAKES.

Duluth, May 20.—Navigation at the beginning of last week was materially delayed on Lake Superior because of storms and just yesterday the boats ran into a heavy snow storm off Keeweenaw Point where the hills are still covered with snow. A brisk northeaster on Monday and Tuesday a week ago with a heavy fall of snow not only held quite a number of boats in the harbor at Duluth, but retarded vessel movements generally. The unusually large number of boats that have found it necessary to anchor in the basin at Duluth this spring has made more evident than ever before the inadequacy of the present anchorage ground not only in the matter of protection about which so many complaints have been made but in area and depth of water. The current through the canal were amply vouched for in their effect upon the fleets recently anchored in the bay, as they have been heretofore less noticeably, when boats were swung almost completely around and drifted in to collision with other boats, similarly situated or tied up at the dock, with sufficient force to cause considerable damage.

The shipping of ore is increasing in quantity continually. The weather moderating in a measure and a very poor week just a year ago has enabled the docks at the head of the lakes ports to overtake the shipments of last year. With this fact accomplished so easily it would seem that the extreme predictions for the season output are in prospect of being fulfilled. The Missabe docks with the Hull-Rust and Morris pits furnishing the bulk of the ore have already handled over a million tons and are moving the boats rapidly. At the Allouez docks a congestion existed for the greater part of last week, owing to a boat shortage among independent interests. Storage capacity was so completely taken that mining work had to be slowed down. This condition is now improved. One-half of the new dock replacing the old No. 1 went into commission last Saturday and the entire dock will be ready about the latter part of July. The dock has the same dimensions as Nos. 2 and 3 and together with the completion of the new transfer yards of the Great Northern railway will be of material assistance in taking care of the 50 per cent additional ore to be handled this year.

The old No. 1 Missabe dock is being partly torn down to supply timber for the new coal dock building near by. What the final disposition of the dock will be has not yet been determined, but it is probable that another new dock will be built as the same reason, namely, the increased production from the western Mesabi which is to bring about the transfer of Mountain Iron ore from Duluth to Two Harbors next year will, in addition, necessitate increased facilities at Duluth. The ore shipment figures for the week May 7-14 are as follows: Duluth, 422,381 tons in 1907, against 109,478 tons in 1906; Superior, 205,885 tons in 1907, against 80,000 tons in 1906, and Two Harbors, 252,853 tons in 1907, against 187,181 tons in 1906. This is an aggregate for the week of 881,119 tons against 376,659 tons a year ago, so that the total for the season up to May 14 is 1,910,764 tons as compared with 1,903,216 tons a year ago. In the few days since these figures were obtained the gain has been increased.

In the grain trade a falling off in the shipments is recorded which is natural with the increasing amount of tonnage given over to carrying ore. Wheat is being carried to Buffalo for 2¼ cents regularly. The statement for the two weeks ending May 18 is as follows:

Week ended May 11.

	Receipts.	Shipments.
Wheat	1,236,318	2,218,699
Corn	2,411	1,037
Oats	107,092	101,225
Rye	5,685	49,247
Barley	120,667	465,441
Flax	412,779	723,117

Week ended May 18, 1907.

	Receipts.	Shipments.
Wheat	1,105,832	823,503
Corn	1,432	3,263
Oats	97,457	15,531
Rye	4,053	62,456
Barley	118,570	231,499
Flax	352,845	317,431

The steamer Maruba, Capt. Boyce, arrived in Duluth today. On her way up she pulled the Saxon off where she was grounded on Caribou Islands. The Maruba began pulling on the stranded boat at 7:45 and continued steadily till 10:20 when the Saxon slid off, her cargo being lightered all the time. The Saxon was able to proceed on down under her own steam. The Saxona of the Tomlinson line, ran into the pier at the Soo and was damaged somewhat on her starboard quarter, but made temporary repairs and proceeded to Chicago. She has again left for Duluth light without further delay.

The wide spouts being used on the Missabe No. 4 dock are working very well, though difficulty was experienced with those whose sides were not sufficiently high at first because of the spilling of the ore all over the decks. The pockets of this dock have three doors occupying the entire width of the pockets so that the ore does not clog in the corners. The ore from the outside doors was shot across the spout, however, and oftentimes was thrown over the sides of the spouts until the sides were made higher.

Nacey & Hynd, of Cleveland, have been appointed lake representatives by the American Bureau of Shipping. The lake branch of the bureau will be conducted with special reference to the requirements of the modern types of lake freight vessels with a view to maintaining the highest standard of efficiency in construction and equipment.

NON-REVERSE COURSES.

Editor MARINE REVIEW:—Just finished reading article entitled "East and West Courses," by "The Man on the Bridge," in MARINE REVIEW May 2. While he has advanced many excellent suggestions, I do not agree with all that he says. What he says in regard to upbound vessels using the outside course instead of downbound boats on Lake Huron is a mistake. It would make no difference whatever if it were not for the dangerous shoals lying to the eastward of the mouth of Detour passage. These shoals can be better left than made; that is, boats coming out of Detour have the opportunity of giving them the right berth, whereas boats entering this passage after running a course of 50 or 60 miles can not be so sure of it, especially in thick weather. Fetching Detour passage is the anxious course on Lake Huron, and in thick weather it is more safe to fetch westerly of Detour than easterly on account of these shoals; in other words, it is more safe to approach Detour from the westward than from the eastward, especially when close in.

The statement that boats leaving Detour by taking the outside course would be afraid of keeping away on account of the dangerous shoals to the eastward of Detour passage, would want to steer out pretty well and would be sure to meet boats coming up Lake Huron, is incorrect.

His suggestion that boats coming out of Detour steer out for 10 miles on Frying Pan and Pipe Island ranges, and then shape a course that would take them 3 or 4 miles off Presque Isle, would be an excellent idea for boats bound up Lake Huron. For instance, from 5 miles off Presque Isle (the present course) steer a course that will fetch, say to a point 10 miles east of Spectacle reef light and fog signal, thence a course to Detour passage. This would insure a safe course to Detour, Spectacle reef lighthouse being a good point of departure. This would be making Detour passage from the west'ard, which is the safest way. Boats going into Detour would naturally hug Detour gas buoy while boats coming out could haul out on their course as soon as the gas buoy was passed.

"The Man on the Bridge" lays too much stress on the right-hand course, parting of wheel ropes and backing to port. This is all right in narrow channels, such as at the entrance to the rivers, etc., but for the open lake it would count for little, for one is as liable to pass boats to starboard as to port.

"The Man on the Bridge" says that 12 miles off Thunder Bay island and Sand Beach is too far to hear the whistles, and suggests 10 miles so that boats pursuing both the inside and outside courses can have a chance to hear the whistles at those points. While this is all right it is not essential. Fog whistles are all right for making the turns, but they cannot be depended upon at 10 miles any more than at 12 miles. How often it occurs that fog whistles cannot be heard at the usual distance off. If the conditions are favorable for hearing a whistle 10 miles it ought to be heard at 12 miles. The whistles at Thunder Bay island and Sand Beach are not necessary for boats following this downbound course. If the proper courses by compass are shaped and steered together with an efficient log checked by a time course and the number of revolutions of the screw propeller to the measured mile, the course can be made good without paying the least attention to these whistles. I do not mean by this that these whistles do not serve the purpose intended for them. They are efficient for boats following the usual course along the shore where it becomes necessary to alter the course abreast of each such light or fog signal.

Too much dependence is placed on fog signals and not enough attention to courses. It is a good deal on this account that the latter is so much neglected. There is no excuse whatever for boats not making good courses on Lake Huron, either up or down, after a master has had a chance to use the ranges in the Soo and Detroit rivers, so that there would be no necessity for boats following the outside course to haul in to hear the whistles in thick weather.

In the laying down of these courses all the dangers of navigation must be carefully taken into consideration, and not simply that of collision. If courses are followed that lead to dangerous points, stranding is invited, therefore, the prevention of collision is sacrificed for stranding. Which is the more important? If we can accomplish the main object without sacrificing anything in relation to the safety of the course, all well and good, but the course is of paramount importance at all times.

The fact that a fog whistle cannot be heard on a course is not necessarily an indication that the vessel is not making good her course, especially when the course has been shaped with a degree of knowledge of such matters.

"The Man on the Bridge" hugs Whitefish point too close and figures his distances off the point too fine for practical purposes. A mile and two miles is too fine. Three and six miles is more like it. This allows for a small error in the course either way, due to bad steering, leeway, etc. One and two miles brings his courses too close together toward the ends of the courses, which are the dangerous points because it is there that boats turn to shape their next course. For upbound boats to pass two miles off Whitefish point and downbound boats one mile, would run these courses almost in one for a considerable distance from Whitefish point, while the object of these courses is to get boats separated as much as possible.

"The Man on the Bridge" says that upbound boats should take the outside course on Lake Superior instead of the inside course, as has already been recommended. This is good logic if we only take into account the crossing of courses. Its purpose is simply to avoid the dangers of collision at a sacrifice of course. The chief objection to the outside course for upbound boats is this: It requires finer manipulation on the part of the master to make the inside courses, since he has to make his turning points closer and is not so far off the land. He dare not get in too close for fear of stranding and out too far for fear of collision by meeting downbound boats in the advent of downbound boats using an outside course. The Soo river ranges always afford a ready and reliable means of insuring the making of good courses up Lake Superior when azimuths and other means are not available as is always the case in cloudy and foul weather. On the other hand these means are not available for boats leaving the west end of Lake Superior for the Soo, but since the downbound course leads well outside and consists of but two courses there is not the chance of stranding as there would be if the usual courses were pursued. Caribou Island light and fog signal afford an excellent check to make Whitefish point correctly after running nearly the entire length of Lake Superior. In summing this matter up I have taken into consideration the operation of the compass under every condition. Where compasses in boats are not subject to change in the case of change of draught, such as from light to loaded or partly loaded, it would make but little difference which course was followed, but in boats where there is an effect, and this is a fact with nearly all of our modern carriers, this is a most important matter and must not be lost sight of for a moment. It is for this reason that I favor the outside course for vessels bound down. If it were not for this, Devil's Island, at the other end of the route, affords a check for making Duluth.

The course from Devil's island to Duluth could be improved upon by shaping a course that would fetch about midway between Duluth and Superior. This is the proper way of running this course under any circumstances, and especially for a thick weather course. You have two fog signals to depend upon instead

of one on the usual course. Such a course would insure safety from the local attraction along the north shore in case the vessel fetched northerly in approaching Duluth harbor. The tendency of this local attraction is to pull boats toward the shore bound in and outward bound out—the same as an easterly effect. It would also give boats coming out of Duluth on an outside course to Devils Island a good wide berth.

I quite agree with "The Man on the Bridge" respecting what he says of the new rule to the effect that a steamer to leeward must keep out of the way of a steamer to windward in thick weather. There would be lots of chance for confusion if this rule became a law. It would seem to me that if some signal made in conjunction with the fog signal of three blasts could be devised to indicate when vessels were coming out and going into narrow waterways, like from Southeast shoal to Detroit river lighthouse, Whitefish point to Gross Cap, and also at turning points where important courses cross one another, such as Whitefish point, that it would help a great deal in lessening the chances of collision. This additional signal could also indicate the starboard and port sides. The great trouble under existing conditions is to tell how each boat is moving, whether coming or going. This is especially true in the case of boats that have practically stopped or are very carefully feeling their way along. Another such signal could be devised for boats coming into these narrows, such signal to indicate the opposite side agreed upon for boats coming out. In the case of boats that have stopped and are not sure of their position in these narrows, the present fog signal of three blasts could be made to indicate this. This would give other boats warning of their presence and location. Such a rule could be practically applied in the narrows mentioned. It should be understood that these signals are only to be used in certain waterways, where boats are obliged to meet and pass one another continually. A similar signal could be devised to indicate the different courses boats are pursuing or about to pursue. For an example: Supposing there are two boats coming out of Detour passage, one being bound down Lake Huron, the other to Lake Michigan, the weather being thick, of course. Now if the one bound down Lake Huron could indicate by her whistle in addition to that of her fog signal, that she was or is to pursue the outside course (starboard helm) and if the one bound to Lake Michigan could signal accordingly (port helm), a boat making the passage bound up would have no trouble whatever in passing these two boats. A boat bound up Lake Huron from Presque Isle to Detour could indicate her course so that boats bound down from Lake Michigan would know it before the intersecting point of her course was reached.

If right-hand courses are to be observed the fact that upbound boats on Lake Superior taking the outside course would not prevent boats bound to Marquette and Portage from Whitefish point from crossing the course of vessels bound down on the inside course. By using the outside course for vessels bound up and the inside course for vessels bound down would neither prevent boats bound from Whitefish point to Marquette and Portage from crossing the courses of boats bound down from those same points. I would suggest that boats bound from the Soo to Marquette and Portage turn Whitefish point at a distance of not more than 1½ miles and then haul down on their courses. Boats bound from Marquette and Portage to Whitefish point should shape a course that will fetch them about 3 miles north of Whitefish point. Alterations in these courses could be made so easily that there would be no trouble in avoiding downbound boats with upbound boats. Boats bound to Devil's island from the Soo would shape their course from a point 4 miles north of Whitefish point to 12 miles north of Eagle Harbor. By following these courses there would be no occasion for boats crossing one another's courses. Boats from Marquette and Portage in rounding Whitefish point at a distance of 2½ to 3 miles could take the west side from there down to Parisian Island, and boats from Duluth and Two Harbors would round Whitefish point at a distance of 6 miles north of it. These boats could take the east side of boats coming up from Gross Cap. This is the bad feature on Lake Superior, but it is impossible to make separate courses to all these points without crossing somewhere, so that at the points of intersection great caution must be observed in meeting and passing in thick weather.

The course to Ashland should be shaped from a point inside of the course recommended from Ashland to Keweeraw point. This could be done by rounding Keweenaw point at a less distance than that given on the chart, say from 6 to 8 miles.

CLARENCE LONG.

THE SECOND SHIP BUILDING NATION.

That Germany is second alone to Great Britain in the matter of ship building is interesting when it is known that this record has been attained in a comparatively few years. It was in 1869, 38 years ago, at the Kiel yards that Germany's great merchant fleet had its inception. A few years later, in 1875, the manufacture of steel sheets was begun by the German yards and before the close of the century there were upwards of 60 ship yards, employing some 30,000 men. These yards are mostly on the Baltic although a goodly number are on the Weser and Elbe rivers.

Foreign aid in the matter of iron and steel is unnecessary as Germany's own great works make her most independent. Since the establishment in 1905 of the Schiffsbaustahlkentck Co. at Essen all orders have been disposed of at uniform rates, which was of the greatest importance to the ship builders. German railroad rates are also very favorable to the great ship building plants.

That the United States takes its place toward the end of the list is owing to the continued hostility of certain interests toward any legislation tending to promote American shipping.

NEW YORK SHIP BUILDING CO. GETS CONTRACT.

The contract for building the eight lighthouse tenders for the government, bids for which were recently published, has been awarded to the New York Shipbuilding Co., Camden, N. J. They are to be built at a cost of $165,000 each, which is $17,000 lower than the nearest competitor for each boat. The total cost of the work will be about $1,325,000.

OBITUARY.

Frank H. Goodyear died at his home in Buffalo last week at the age of fifty-nine years. He was born at Groton, N. Y., and in his early youth taught school, later becoming bookkeeper in a saw mill. In 1872 he went to Buffalo and engaged in the coal and lumber business. At that time the hemlock and pine forests in Pennsylvania were practically unimpaired. Mr. Goodyear undertook his exploitation, purchasing cheaply tracts of timber land from which he and his associates were later to derive millions. He was president of the Buffalo & Susquehanna Railway Co., connecting the lumber and coal regions of Pennsylvania with the great lakes; the president of the Buffalo & Susquehanna Coal & Coke Co. and president of the Buffalo & Susquehanna Iron Co. He also had investments in marine property, the steamer Frank H. Goodyear being named after him.

A. P. Moorehouse, general manager of the Cunard Steamship Co., died at Liverpool last week. He had been ill for some time.

SCIENTIFIC LAKE NAVIGATION

BY CLARENCE E. LONG

PROCESS BY RECIPROCAL BEARINGS.

Should there be no suitable object visible from the ship, and at the requisite distance, the deviations must be ascertained by the process of reciprocal bearing. A careful observer must go on shore with a second compass and place its tripod in some open spot, but strictly removed from local magnetic influences and where it may be distinctly seen from the standard compass on board. Then by means of preconcerted signals the mutual bearings of these two compasses from each other are to be observed at the moment when the ship's head is steady on each of the thirty-two points successively, as before directed. The mode of registering the observations, when this process with the two compasses has been adopted, is shown in the accompanying specimen form:

FORM FOR REGISTERING THE PROCESS BY RECIPROCAL BEARINGS.

	Simultaneous Bearings.		
Ship's Head by the standard Compass.	From Standard compass on board.	From the shore compass.	Deviation of the compass.
North .....N	20° E	S 15° W	5 Wly
N by E....N	25 E	S 19 W	6 Wly
NNE .....N	31 E	S 24 W	7 Wly
etc.	etc.	etc.	etc.

To ensure the success of this operation the compass on shore should not be more distant from the ship than is consistent with the most distinct visibility with the naked eye of both compasses from each other. The observations should be made as strictly simultaneous as possible and, to guard against any mistake, such as might be occasioned by a signal being misinterpreted, the time at which each bearing is taken should be noted, both on shore and on board by compared watches. For instance, a signal is made on board for the observer on shore to take a bearing of the observer on board. At this instant the observer on board takes a bearing of the observer on shore, and at the same instant both observers take the time by watch. The observer on board, of course, keeps tab as to the direction of the ship's head at the time of each observation.

It has been found a very convenient practice for the observer on shore to chalk each observation upon a blackboard. By this process, or by the use of signal flags or semaphore, if there should be any apparent inconsistency the observation can be immediately repeated and the necessity for again swinging the ship thereby prevented.

The student should remember that the bearings of the shore compass, (which, in each case, is the correct magnetic bearing) are to be reversed before the deviation can be found. For instance, in the foregoing example, when the ship heads north by standard compass, the observer on shore (his compass) bears N 20° E, but the bearing of the standard compass on board from the compass on shore at the same instant, is S 15° W. This reversed is N 15° E, which is the correct magnetic bearing, or the bearing it would have been from the ship had not the ship's magnetism influenced the compass. The difference between N 15° E and N 20° E is 5°, and as the correct magnetic bearing is to the left of the compass bearing the deviation is named westerly.

INDEX ERROR OF THE COMPASS.

The vessel should be made to describe two circles, one with a port and one with a starboard helm. Two sets of deviations will be obtained; the mean of these will be a correct table. The best results will be obtained by steaming slowly in a circle as large as the station will permit; it is also advisable to frequently tap the compass to overcome any friction on the pivot.

This has reference to the index error of the compass, and is frequently the result of magnetism, induced when the ship's head was on one point of the compass, being retained when her head is swung to some other point. The value of this error, of course, is greatest when the ship is swung quickest. Ordinarily this error should be the same on each observation, but where friction enters the problem, and the ship not swung and steadied uniformly, this can not be. However, this error is small in amount. Usually it is easterly when the ship is swung against the sun, and westerly when swung with the sun. In case of easterly deviation and the ship swung with a starboard helm the actual deviation would be increased; if swung with a port helm decreased.

When selecting a range which is taken from the chart, and which is to be used for finding the deviation, pick out objects which are distant from each other at least two miles and in a locality where the vessel can pass within a mile of the front object of the range. A good rule to follow in selecting a range is to pick out one, where the front and rear objects will be two or more miles apart, and where the vessel will be over one-half as far from the front object, when she is passing it, as the front object is from the rear object.

IN A WOODEN SHIP.

If the observations for deviation had been made in a ship built entirely of wood and other non-magnetic materials the compass needle would point in the direction of the magnetic meridian, then the correct magnetic bearing as computed compared by the bearing as found on board would be precisely the same thing; or the difference between the true bearing and the observed bearing will be the Variation.

Now-a-days all vessels have iron and steel entering into their construction and equipment to such an extent as to produce an independent magnetic effect on the compass by which the needle is attracted to one side or the other of the magnetic meridian on the various headings of the ship by an angular amount that is called the deviation of the compass, so that when the true bearing of a celestial body is compared with its compass bearing, as observed in such a vessel, the difference between the two bearings, called the total correction of the compass, shows the combined effect of the variation of the compass and the deviation of the compass, or the combined influence of the earth's magnetism and of the ship's magnetism upon the pointing of the compass. The relation between the total correction, deviation and variation will be seen by the formula:

Total correction = variation + deviation, in which easterly variation and deviation have the sign +, and westerly variation and deviation the sign —.

AN UNCERTAIN QUANTITY.

The variation of the compass, as laid down for the open lakes, is of an uncertain quantity and should not be depended upon to the degree; hence, ships cannot be headed truly on account of a lack of accurate knowledge of the variation of the compass. Every mariner knows there are other causes why a ship cannot be held true to her course, but no one error can be any worse than the one of wrong variation. Navigation, at best, is a rough process as compared with surveying. All first-class charts are made, from the beginning of the survey to the final execution of the chart, with a nicety much greater than is attainable in the processes of navigation. A vessel, in pursuing her way, is subject to many uncertainties of the distance and the course not clearly made known by the instruments used in navigation. However accurate a chart may be, it is of no avail

to attempt to plot the run of the vessel upon it with any greater degree of nicety than has been used in ascertaining the run by the means that have been used; that is to say, by means of instruments, etc. The inaccuracy of the variation is one source of this error.

OBSERVATIONS FOR VARIATION.

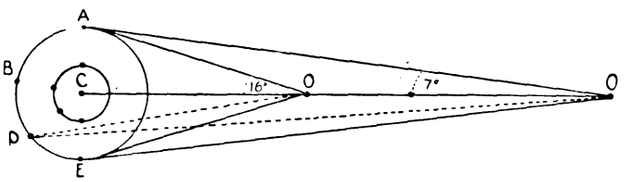
Most of the observations for variation, especially those of the open lakes, were taken a good many years ago, when instruments of precision were unknown, to say nothing of the other errors of observation. Again, the annual change in the variation is a quantity not to be relied upon, simply because there is no regularity to the change, and the change found for one station would not agree with the change for a second station even though it be not far removed from that of the first. With the rough instruments (rough compared with those of the present time) then in use, together with the faulty methods of observation, the inaccuracy of this problem must be apparent. It is safe to say that no observation is closer than the even degree. The annual change is determined by observing the variation after a lapse of years; the difference divided by the number of years that have elapsed, gives the annual change. Probably, the variation had only changed a half degree during the interval, an amount hard to detect with the instruments then in use. This is the manner in which the variation is computed and kept corrected in certain places. The variation thus found does not agree with the variation as found by observation, after a lapse of years. Considerable difference is found in the observed variation and that of the computed variation. The government is and has been establishing more accurate data on this subject, both in establishing the correct amount and also in correcting the annual change. There is still a great amount of navigable territory on the lakes to be covered by such observations. This variation subject is of inestimable value to the lake navigator, and he is just beginning to appreciate its service now that the Time Azimuth mode is coming into general use on the lakes.

TO NAME THE DEVIATION.

In naming the deviation ascertained from ranges, recollect that if the shore bearing is to right of the compass bearing, the deviation is easterly, and if to the left, westerly.

ON SHORT RANGES.

It is a very difficult matter to place a ship's head exactly on a short range and keep it there for any length of time. This is owing to the short distance between the ranges, making it possible for the ship to swing two or three degrees without being detected. Another thing, no two officers will agree as to when the ship's head is on the range. This is often due to the fact that they do not view it from the same line of position. The wheelsman usually stands to one side or the other of the wheel, and in placing the vessel's head on the range, he does not see it the same as he would were he to stand directly over the center of the wheel.



Showing the effects of parallax of the compass when a ship is swung in a large circle and short distance from object as compared with a small circle and a great distance from object. O O objects on shore; A B D E circle the ship is swung in. The lines drawn from them to O O show the angle of parallax due to the closeness or farness of the objects from the ship, and also a comparison of the size of the circles the ship describes while observing bearings of O O.

THE DEV. FOR SHIP'S HEAD AND NOT FOR THE BEARING.

Be careful when correcting a bearing, not to commit the blunder of taking the deviation from the bearing point. It must, of course, be taken from the one which corresponds to the deviation of the ship's head at the time of observation. This mistake has frequently been made.

Deviation always refers to the ship's head. In other words, where deviation is given it means for a certain course. If the deviation table or curve tells us that the deviation on NE is 8° Wly, it signifies that when the ship's head is NE there is that amount of deviation.

CARE OF BEARING INSTRUMENT.

See that the bearing instrument is in good condition, and before using, it should be examined to see that the attachment revolves freely and smoothly in every direction. If it be an azimuth attachment, see that it does not throw the compass bowl out of level. The levelling bubble on the bar of the attachment will show whether or not the instrument is plumb.

GENERAL OBSERVATIONS.

In the foregoing processes for obtaining the deviation of the compass it has been assumed that every facility for swinging the ship has been available, but as circumstances may render inconvenient the making of observations in detail from point to point of the compass, there will be found below the description of a graphic method whereby from the deviations determined, as the ship swings round at anchor, or otherwise, on any direction of the ship's head a curve of deviations of the thirty-two points may be constructed and the deviation determined for each point of the compass. This method has the further advantage that any number of observations made in the complete circuit of the ship may be made use of and the accuracy of the curve and the table proportionately increased.

GRAPHIC METHOD OF FORMING TABLE OF DEVIATION.

On a sheet of accurately ruled paper draw a vertical line down the center, representing the magnetic or correct magnetic, North and South. The equidistant horizontal lines may be taken as points of the compass on the vertical scale, and the degrees of deviation on any convenient scale measured from them right and left from the vertical line. Easterly deviations should be plotted on the right, westerly on the left.

A flowing curve being drawn through each point plotted on the paper, the deviations for every direction of the ship's head may be determined by measuring from the vertical line.

The symmetry or otherwise of this curve will indicate (in the case of vessels where the iron is regularly disposed round the compass) the correctness of the deviations obtained; also the amount of agreement between the flowing curve and the Line traced by joining each point plotted will show if any individual observations have been incorrect.

Should any point be omitted in swinging the ship the deviations on them can be measured from the curve drawn as above.

From the observations thus made, or by either of the processes which have been described, a table of the results should be forthwith constructed for general use and copied by every person on board who keeps a reckoning.

SHIP'S HEAD BY COMPASS OR CORRECT MAGNETIC.

It must be remembered what has been said about the deviation corresponding to the ship's head by compass and the ship's head correct magnetic. In all this work, except where the vessel heads directly on a range whose correct magnetic bearing is known, the deviation corresponds to the ship's head as indicated by compass. In running the ranges of the St. Mary's and Detroit rivers, coming in and going out of harbor piers, the deviation can always be obtained for the ship's head correct magretic instead of ship's head by compass. In Azimuth Work we

will show a method that not only simplifies this entire operation, but does away with about 90 per cent of the work involved under the above named processes.

THE AZIMUTH METHOD THE BOSS.

Note.—Since by the azimuth method it is possible to determine the deviation of ship's head correct magnetic in the first instance, it is not intended to do away with the graphic methods of plotting and drawing a curve of deviations. These graphic methods are invaluable and should be used in conjunction with the azimuth mode, as it will answer as a check to this work. If the master has a table of deviations from azimuth observations he will want to verify the correctness of same by finding the deviation from ranges, or land objects. A curve drawn from these observations will tell the story. The beauty of a curve lies in the fact that you can find the deviation for any fractional point of the compass with as much ease as from the full point. A table of deviation does not afford this facility.

WHEN THE DEV. IS ON THE FULL POINT.

Finding the deviation by river and harbor ranges by heading on them, it will, of course, be impracticable, in a majority of cases at least, to get the deviation exactly on a cardinal or intercardinal point, as is oftentimes desired. In such cases two or more observations may have been taken with the ship's head correct magnetic near such point. For example: Supposing it were desired to know the true deviation on South, from the following observations: S 15° E, the Dev. was 5°; S 7° E was 10°, and for S 8° W was 16°. In case no blank form, or deviation diagram, is available, proceed as follows:

HOW TO GET AROUND A DIFFICULT PROBLEM.

Draw a horizontal line to represent the line of no deviation. Draw a perpendicular line to this to represent the point of the compass you desire the deviation for. Adopt a scale of equal parts, say an eighth of an inch to a degree, and mark off the horizontal line from the point cut by the perpendicular, the number of eighths of an inch that agrees with the number of degrees the ship's head was from the cardinal point at the time the several deviations were determined, these distances or stations being taken to the right or left of the first perpendicular according as the ship's head is to the right or left from the cardinal, or whichever point decided upon. At each of these stations draw a perpendicular, and on these perpendiculars lay off by the same scale of equal parts distances from the horizontal line proportioned to the deviations observed when the ship's head was in the direction corresponding to the stations respectively. Now draw a curve freely through the points marking these distances, and the distances above the horizontal line at which this curve cuts the first drawn perpendicular will measure the true deviation with the ship's head on the cardinal point.

The foregoing example, when laid down is shown in Fig. 37, shows that with the ship's head South the deviation will be 13½°.

BAXTER'S DEVIATION DIAGRAM.

Baxter's deviation diagram is without doubt the handiest device for plotting the deviations thus far introduced, since it requires no measuring with dividers or other instrument. All that is necessary is to find the compass point for which the deviation is known. Follow this out to the central line, and with the number of degrees of the deviation count a square for each degree and make a dot at the

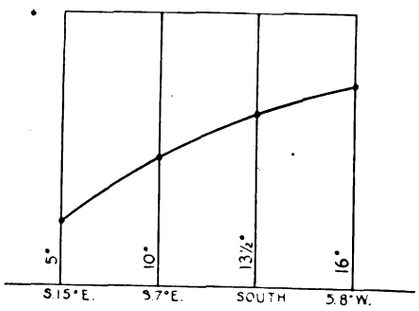


FIG. 37.

last one. Do this with each one of the points of observation after which draw the curve.

WHEN THE DEVIATION IS LARGE.

To obtain a fair deviation curve a sufficient number of observations for deviation should be taken while the ship swings through an entire circle. In general, observations made on every alternate point of the compass are sufficient to establish a good curve, but in cases where the maximum deviation amounts to 40° or more, it often becomes necessary to observe on every point. There are cases where the deviation is so great that a curve could not be drawn of it until the compass is first adjusted.

Recollect that the dotted lines in Napier's deviation diagram represent compass courses or compass bearings, and the plain lines correct magnetic courses or bearing; or thus,

..... Compass Courses.

———— Correct Magnetic Courses.

THE VALUE OF THE DEV. CURVE.

Now, that compass adjustment is so universally resorted to, these deviation diagrams are hardly wanted; all the same, it is well to know and understand them. In fact, the deviation after adjustment, can be drawn to a curve and be of much more utility than the same data in tabular form.

CAUSES OF HEELING DEVIATION.

The three principal causes of the heeling error are vertical induction in transverse iron (such as iron deck beams), induction in iron vertical to the ship's deck, and the vertical component of the sub-permanent magnetism. The part arising from vertical induction in transverse iron is due to the fact that such iron as beams, by departing from the horizontal position, and inclining to the vertical as the ship heels, acquires polarity in its ends by induction from the earth, of the same sign as that of vertical iron in that hemisphere. This polarity tends to draw the north point of the compass to one side or the other.

The part arising from induction in iron vertical to the ship's deck is due to the fact that such iron is not vertical to the earth when the ship heels. The amount of magnetism induced therein is less in quantity, but by the poles becoming on one side of the compass, instead of vertically under it, the north point is drawn to one side or the other.

The part arising from the vertical component of the ship's sub-permanent magnetism, arises from the fact that although the force remains the same in amount, it becomes on one side or the other as the ship heels, and so deflects the compass needle. There would also be a deflection from the ship's sub-permanent transverse magnetism, unless it had been corrected by magnets.

NEEDLE DRAWN TO HIGH SIDE.

In the northern hemisphere, the north point of the compass is usually drawn to the high side, because the higher ends of the beams, and the upper ends of vertical iron which terminates below the compass, and so go toward the high side when the ship heels; both have blue magnetism by induction in the northern hemisphere, and so draw the point of the compass to the high side. It is plain to be seen that on northerly courses the deviation will be westerly with a starboard heel and easterly with a port heel. On southerly courses the reverse is a fact. If the compass is near vertical iron, such as the funnel, having its upper end above the compass, the force to the high side is diminished.

When a ship heels a magnetic force previously vertical is no longer so, and the position of the iron about a compass may be so changed with reference to the earth's magnetic force, that new forces may arise from induction.

The heeling deviation usually has a minimum value on courses near east or west, because the disturbing force is then acting in the direction of the compass needle. Just imagine the ship heading east with a starboard list. The upper ends of the deckbeams near the compass,

have blue magnetism, and the compass needle's length being in the same plane, has a tendency to hold the needle in place. The heeling deviation usually has a maximum value on courses near north or south, because the disturbing force is then acting at right angles to the compass needle.

GIVES THE COMPASS A SWINGING MOTION.

The effect of the heeling error also tends to produce an oscillation (swinging motion) of the compass card when the vessel is rolling deeply; the directive force of the needle is often wrongly blamed for this unsteadiness of the compass card. In vessels where the compass is not adjusted, this fickle condition will be noticed more when the ship is on northerly or southerly courses than on easterly or westerly courses, for the reasons already stated. This source of disturbance can readily be detected in a seaway by watching the compass and the ship's head. If the card swings faster than the ship's head then it is probably due to this trouble. With a compass fully adjusted except the heeling magnet, this trouble will not be so pronounced as in an unadjusted compass; nevertheless it is highly important that the compass should be adjusted for heeling. Heeling deviation is, of course, proportional to the amount of heel of the vessel.

ARE PRACTICALLY THE SAME THING.

It now becomes necessary to explain the term "sub-permanent" magnetism as employed in distinguishing the ship's magnetic character. The sub-permanent magnetism of a steel ship is first acquired from the earth's inductive influence while the ship is being built, and although it undergoes a considerable reduction after the ship is launched and her head reversed from the direction it had while building, but, nevertheless, a greater amount of it remains. It is not so stable as regards permanency that it is not susceptible to changes, and for this reason it is called "sub-permanent" to distinguish it from the magnetism of a magnetized steel bar, which is of a much more permanent character. The sub-permanent portion of the ship's magnetism relates only to the hull, that portion born with the ship, and is separate from the magnetism of the boilers, engines, funnels, masts and other such equipment, which become magnetic through induction, but change on a change of latitude. After a time this sub-permanent magnetism, which is sometimes termed the ship's "general" magnetism, becomes stable in amount, irrespective of geographical position, and the color of its poles is not subject to change. The term sub-permanent is also employed to distinguish it from the magnetism induced in detached masses of vertical and horizontal iron, each of which produce a different action on the compass needle, and in each case is compensated by an entirely different process. To render the term sub-permanent less confusing, it should be regarded as denoting the permanent portion of the ship's magnetism, which it really is. These terms should be considered as synonymous. As this portion of the ship's magnetism is counteracted by the application of permanent steel magnets, this portion of the magnetism must be like in name and so are the terms sub-permanent and permanent magnetism.

To be able to draw the deviations of a compass to a curve in accordance with any of the known graphic methods is of the greatest importance to the navigator. Being acquainted with the principle of drawing the curve and to understand its fundamental parts, one is able, by simple arithmetic alone, to deduce from it data that could only be solved after long and tedious operations in trigonometry.

The total deviations of a compass are as a usual thing irregular and do not increase or decrease from point to point with uniformity, that is to say, the actual movement of the ship's head in azimuth is not coincident with the change of her head as shown by compass. The process of swinging ship enables us to obtain the total or natural deviation of the compass, and by drawing it to a curve it enables us to determine the deviation on every point and fractional point whether an observation on that point had been taken or not. This is the great service that a deviation curve renders for it graphically solves a rather intricate trigometrical equation. It reveals to the eye the real conditions existing where no figures are at hand, or between the points where no observations were taken or to be had.

There are three principal parts which constitute the total deviation; these are the constant deviation, the semi-circular and quadrantal. Each one is due to a separate cause, and to treat them intelligently each must be solved into its component parts and deducted from the total. It is owing to these three causes combined that generally results in an unsymmetrical deviation curve, or what is the same thing, why the deviation is irregular and does not increase and decrease uniformly. Nevertheless the total deviation is made up of three regular and symmetrical curves. This reveals itself when the total curve is separated into its component parts and the value of the coefficients which enter into each are determined.

The Detroit & Buffalo Steamboat Co. has just issued an attractive time card of the schedules maintained by the steamers Eastern States and Western States between Detroit and Buffalo.

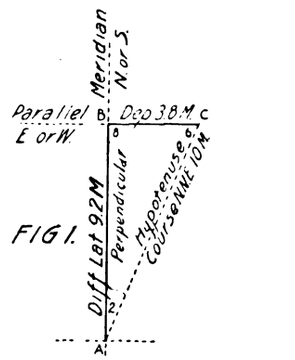
QUERY AND ANSWER.

(Continued from April 18.

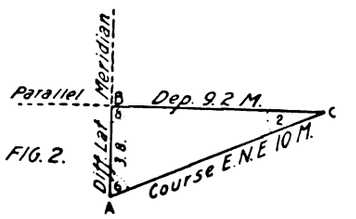
For your benefit and others I will give a brief explanation of right-angled trigonometry with definitions and principles. Trigonometry is simple enough when it is explained in a common sense way, and it is far from being beyond those having a common arithmetic education. Here goes:

Every triangle consists of six parts; namely, three sides and three angles.

The sum of the three angles of every plane triangle is equal to two right angles, or 180 degrees; hence, if one of the angles be known, the sum of the other two may be found by subtracting the given angle from 180 degrees; also, if two of the angles be known, their sum, subtracted from 180 degrees, will give the third angle; again, in a right-



COURSE N.N.E. 10 MILES. 2 PT. COURSE



COURSE E.N.E. 10 MILES. 6 PT. COURSE

angled triangle (the right angle containing 90 degrees or 8 compass points), the sum of the two acute angles is equal to 90 degrees; therefore, if one of the acute angles be given, the other will be found by subtracting the given angle from 90 degrees. An acute angle is less than 90 degrees. You can use compass points as well as degrees; 8 pts. or 90°; 4 pts. or 45°, etc.; 180° and 16 pts. are the same. The three angles of every triangle equal 16 compass points. In Fig. 1, if angle A (formed by the lines AB and AC) is 2 points its opposite angle must be 6 points, since the two must equal 8 points or 90 degrees. For the same reason if angle C is 6 points then angle A must be 2 points.

Any two sides of a triangle added together are greater than the third side.

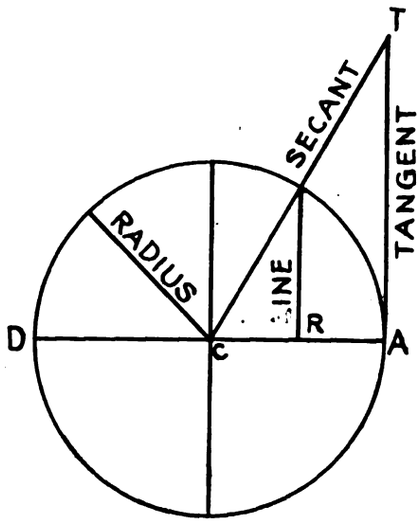
The greatest side (of course, distance or hypotenuse) of a triangle is opposite the greatest angle, and the last side opposite the least angle; also, in the same triangle, equal sides are opposite to equal angles. It is important to remember this since the angles will help you with sides and vice versa.

In every right-angled triangle there must be two parts given, besides the right angle (which is always known), to find the other three; and one of these parts must be at least a side, because the angles will only give the proportion, not the absolute length of the sides.

In every such triangle one of the sides must be considered as representing the radius of a circle; then,

1. If the hypotenuse be made radius, the perpendicular and base will be the size of its opposite angle.

2. If the base be made radius, the perpendicular will be the tangent of its opposite angle, and the hypotenuse the secant of the same angle.



The sine of an arc is a line drawn from one end of the arc perpendicular to a diameter drawn through the other end of the same arc; thus, RS is the sine of the arc AS, RS being a line drawn from one end, S, of that arc perpendicular to DA, which is the diameter passing through the other end, A, of the arc.

The tangent of an arc is a right line drawn perpendicular to the diameter, passing through one end of the arc and terminated by a line drawn from the center through the other end of the arc; thus, AT is the tangent of the arc AS.

The secant of an arc is a right line drawn from the center through one end of the arc to meet the tangent drawn from the other end; thus, CT is the secant of the arc AS.

3. If the perpendicular is made radius, the base will be the tangent of the opposite angle, and the hypotenuse the secant of the same angle; the sine, tangent, or secant of an angle, in each case, to co-sine (complement), co-tangent, or co-secant of the other.

Thus, if in the triangles ABC, the hypotenuse AC be considered as radius of a circle, then it is evident the perpendicular BC will be the sine of the angle A, and the base AB the sine of the angle C; if the base AB be made radius, then the perpendicular BC will be the tangent of the angle A, and the hypotenuse AC the secant of the angle A; if the perpendicular BC be made radius, then the base AB will be the tangent of the angle C, and the hypotenuse the secant of angle C.

To find a side: Consider any one of the sides as representing the radius of a circle, and write upon it the word radius; then upon the other sides write the parts they represent according to the preceding rules, which call the names of the sides; then say:

As the name of the given side
Is to the given side,
So is the name of the side required
To the side required.

To find an angle: Consider one of the given sides as representing the radius of a circle, and write upon it the word radius; and upon the other sides write the parts they represent according to the preceding rules; then say:

As the side representing radius
Is to radius,
So is the other given side
To the sine, tangent, or secant of the angle by it represented.)

In order to exemplify the foregoing rules we will take the example you have given: the base and perpendicular given to find the hypotenuse. To find the hypotenuse: The logarithm of radius is always 10.00000. The base and perpendicular given to find the angles and the hypotenuse:

To find the angles by logarithms:

As base BA 15	1.17609
Is to radius	10.00000
So is perp. BC. 25	1.39794
	11.39794
	1.17609
To tang. of Ang. A 50°	10.22185
90	
Angle C. 31°	

Note.—If angle A is 59° angle C must equal what 59 lacks of 90 degrees. Angle C equals the course back, being S 31°W, or SSW¾W.

We can find angle C first if required, by changing the above proportion, making the 3d term the first term and first the 3d, thus,

1.39794	
10.00000	
1.17609	
11.17609	
1.39794	
9.77915 = 31°, or 2¾ pts.	

To find the hypotenuse:

As radius	10.00000
Is to base BA 15	1.17609
So is sec. of angle A 59°	10.28816
	11.46425
	10.00000
To the hypo. AC 29	1.46425

Note.—The above is simple proportion or the Rule of Three. To perform mulitplication in logarithms the logs are merely added and division is performed by simple subtraction. With a book of lagarithms and the foregoing explanations almost anyone ought to be equal to simple trigonometery. There will be further explanations on this subject in lessons to come, so that everybody interested should preserve this.

OBITUARIES.

John McNaughton, assistant lock keeper, known to every captain on the lakes, died at Sault Ste. Marie recently.

Capt. Alexander A. Johnson, eighty-five years old, one of the oldest and best known captains, died at his home at Fennville, recently.

Capt. Byron Whitaker died at his home in Detroit recently. He was born at Hamburg near Buffalo, N. Y., and went to Detroit in 1860, entering the ice business in the firm of Whitaker & Robb. He later sold out to become a vessel owner and at one time had an interest in a number of steam and sailing vessels. He had not latterly been active. He was seventy-six years old.

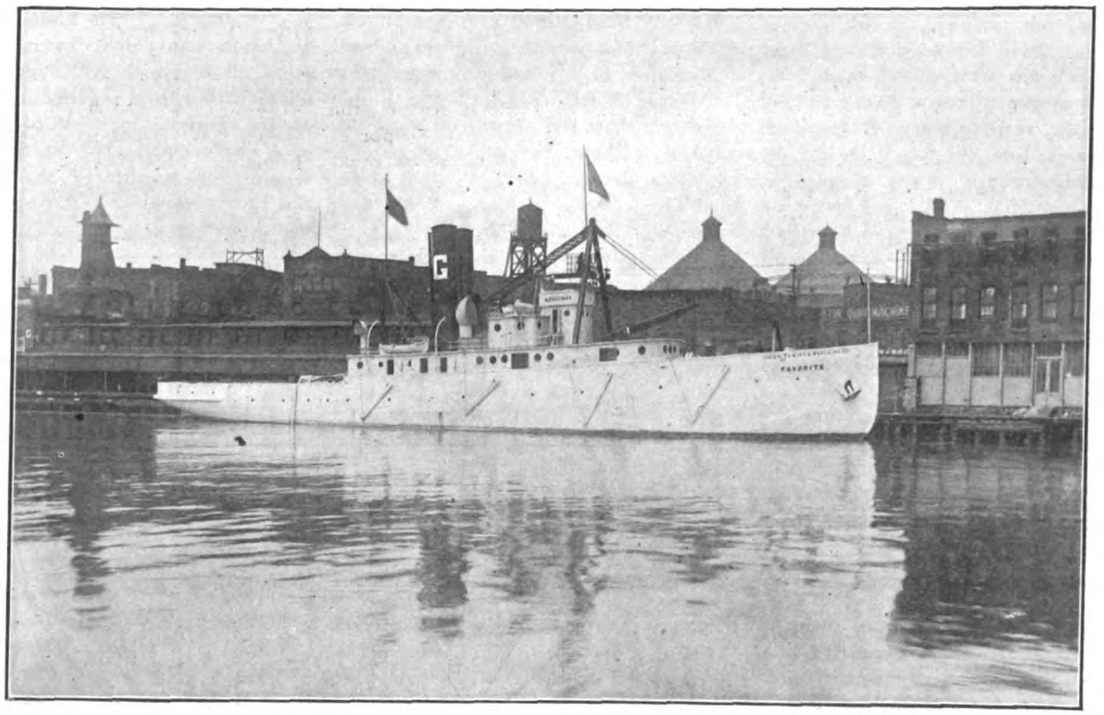
Capt. Adelbert Krech of the Hamburg-American liner Graf. Waldersee died at sea on May 6 of pneumonia He was born at Berlin March, 1853, and studied at the Frederick gymnasium of which his father was a director. After receiving his diploma he shipped on the Hamburg sailing vessel and then entered the naval service at Kiel. He made the trip to Iceland as commander of a German schooner. He entered the Hamburg-American line service on March 14, 1883, as fourth officer and became a captain on Jan. 1, 1891. He commanded the Valdivia on her South Pole expedition, the Columbia, the Bluecher and the Graf Waldersee. He was to have taken command of the new Hamburg-American liner General Grant had he lived. Capt. Krech had received many decorations and presents for gallantry. Some of these are the Royal Prussian Order of the Red Eagle, the Knight Cross of the Royal Saxonian Albrecht Order, the Knight Cross of the Roumanian Crown, the Turkish Medjidi Order, a gold medal from the Royal Scottish Geographical Society, a gold medal from the German Emperor for rescuing shipwrecked sailors, a loving cup from President Cleveland and a diploma of honor for rescuing shipwrecked sailors.

WRECKER FAVORITE.

The wrecking steamer Favorite, of the Great Lakes Towing Co.'s fleet, was inspected at Cleveland last week by a number of vessel owners while enroute to her station at St. Ignace, having made the run from Buffalo in about fifteen hours. Both builders and owners were well pleased with her performance on the run. Vessel owners who inspected the Favorite gave her unstinted praise. She is certainly the most complete wrecker that has ever been built on the lakes and a party of leading underwriters from New York who saw her were delighted with her. The wrecker was described in the MARINE REVIEW of Feb. 7, 1907, but briefly it may be stated that she is 195 ft. over all, 180 ft. keel, 43 ft. beam and 19½ ft. deep. Her water ballast capacity is 600 tons and her fuel bunkers, which are in the spar deck aft of the pilot-house, hold 240 tons of coal. She is of unusually powerful construction in order to act as an ice crusher if necessary. The hull is pierced by only two gangways on the side 3 ft. wide and 5 ft. high, and she has no windows whatever except in the pilot-house, the hull and cabin being lighted by dead-lights. She is intended to work in any kind of weather. She has a steel A frame derrick forward with 60-ft. steel boom capable of handling a 3-ton grab bucket. She has a 5-ton boom derrick aft for handling plates and material in and out of after hatch and also for raising and lowering her power launch. She will carry a complete machine shop so as to make practically any repairs that strandings and collisions may entail on steamers. The Favorite will be commanded by Capt. Alex. Cunning, who will endeavor to equal in 1907 the record that he achieved in 1906 when he salved every steamer that the Great Lakes Towing Co. sent him after.

Among those who made the trip from Buffalo on the Favorite were Edward Smith, president of the Great Lakes Towing Co.; Edward N. Smith, superintendent of the Buffalo Dry Dock Co.; Mr. W. I. Babcock, her designer; Mr. Henry Penton, who designed her machinery; Wm. Dempster and Joseph E. Ball, of Buffalo; A. C. Harding, of Chicago; A. S. Blanchard, Capt. Thomas Johnson and Capt. Philip Broderick.

While in Cleveland Charles Wright, of London, chairman of the London Salvage association, and F. Hermann, Walter Dasbad and C. E. Deane, marine underwriters of New York, accompanied by R. Parry Jones and E. P. Lenihan, of Cleveland, inspected the Favorite and pronounced her the most completely equipped salvage steamer in this country.



WRECKER FAVORITE OF THE GREAT LAKES TOWING CO.'S FLEET.

LIQUID FUEL.

The steamship Goldmouth, a vessel which burns petroleum fuel, recently arrived at Thameshaven after a passage from Balik Pappan, in Borneo, a distance of over 12,000 miles, without making a stop. The revolutions averaged 54.3 and the speed throughout the passage averaged over nine knots. This is the third non-stop run made by this vessel while burning liquid fuel, the first being from Singapore to Rotterdam, in May-June, 1906, and the second from Singapore to Thameshaven in September-October, 1906. Probably there is no other recorded instance of a single vessel having made three non-stop runs of such duration with liquid fuel.

The steamer Jim Sherrifs, purchased by the Nessen Transportation Co., has been rechristened the Peters.

The Detroit Ship Building Co. will furnish new kits for workmen who lost their tools on the City of Cleveland.

Between the hours 5 a. m. and 3:30 p. m. on Monday, 111 boats passed through the Lime Kiln crossing, an average of a boat every 6½ minutes.

The government engineer at Duluth, Major Graham D. Fitch, has issued a list of timber requirements comprising a total of 3,718,675 feet of lumber for the improvement of the Duluth-Superior harbor and bids are asked. Sealed proposals will be received until June 12, 1907.

COURT DECISIONS.

CONSTRUCTION OF CHARTER PARTY.—A yacht was chartered for a specified sum for a portion of the year 1905, the charter providing for a deduction from the consideration in case the yacht from any accident arising from any defect therein should be disabled for a period of more than 48 hours. The charter also provided that the owner agreed to let, and the hirer agreed to hire, the yacht for the time specified; that the owner should fit out the yacht, and hand her over to the hirer, tight, staunch, strong and in every way fitted for service, and provide an efficient crew, clothe them, and pay their wages; that the owner should assume the responsibility of fire and marine risk, and the hirer should be responsible for any injury amounting to less than $100, should pay the running expense of the yacht other than the wages of the crew, and should have control of the captain and engineer with authority to discharge them. Under this agreement the district court for Maine held that the contract was a letting of the vessel, and not a mere contract of service, so that the charterer became the owner for the voyage.

USE OF IMPROPER APPLIANCE IN UNLOADING.—Where a vessel undertakes to furnish tackle for loading and discharging cargo, it is under duty to use reasonable care to provide such as will meet the requirements placed on it by the stevedores in conducting their work in the customary manner. The district court for the eastern district of New York holds that where stevedores who were discharging a cargo of sugar, with the knowledge of the vessel's officers, substituted for a wire fall provided at one hatch to hoist cargo from the hold a rope fall used at another hatch for a different purpose, which was of insufficient strength and broke when a sling caught under the hatch coaming, the vessel is liable for an injury resulting to a stevedore working in the hold.

DUTY TO CARE FOR INJURED SEAMEN.—The United States court of appeals for the third circuit holds that a seaman injured in the course of his employment by his own negligence does not thereby forfeit his right to cure and maintenance at the expense of the vessel, where the injury was not caused by his gross negligence or willful neglect of orders. The case also holds that the obligation of a vessel to furnish medical attendance, etc., to a seaman injured in her service does not end with the termination of the voyage, where there was not sufficient time or facilities for the vessel to have then performed its duty.

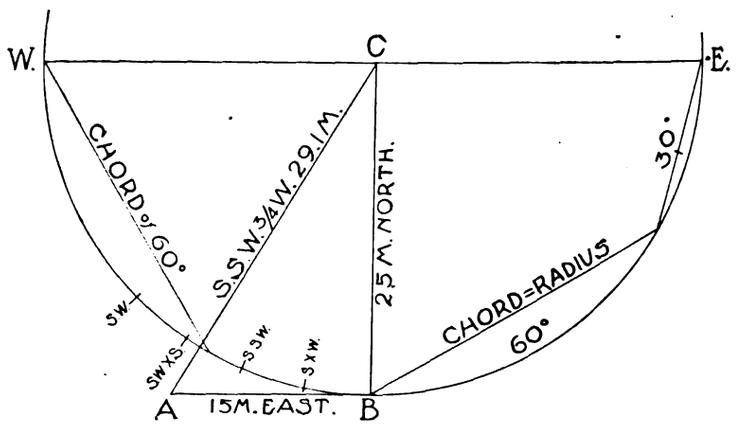
TOWAGE.—A case before the circuit court of appeals for the second circuit holds that a tug is not liable merely because a tow was injured while in its custody, but in an action against it to recover for the injury, the burden rested upon the libellant to affirmatively prove negligence or fault, which cannot be presumed merely because the injury is not otherwise accounted for.

QUESTIONS AND ANSWERS.

Editor Navigation Department.—I wish to thank you for your very clear explanation of my question answered in MARINE REVIEW of April 18. I understand that this problem may be worked without the traverse tables, chart and parallel ruler. What is there to this? A MATE.

Detroit, Mich., April 29.

Answer.—It may be done as shown in the following illustration:



Explanation.—Draw an east line of a length of 15 equal parts, A to B; erect a perpendicular, or north line from its extremity of 25 equal parts, BC. Connect the ends of these two lines by a straight line, CA. This last line represents the course and distance back to the starting point after having gone 15 miles east and 25 miles north. To ascertain its length measure it by the same scale of equal parts that the other two lines were measured by. With the length of the north line as radius describe a circle that will pass through the beginning of the north line (B). Next divide the circle into points, the same as laying off the points of the compass. Where the line CA intersects with the circumference drawn represents the course to be steered from C to A, or the course back to the point of starting after having gone 15 miles east and 25 miles north. Any size circle may be drawn to get the division of the points of the compass. Other problems of this nature may be solved in a similar manner.

Note.—It is well to know that the radius of a circle is always equal to a chord of 60°, or two-thirds of 90°. That is to say, if it were desired to lay off an arc of 60°, or an angle of 60°, all that would be necessary would be to take the length of the radius between the points of the dividers and lay it from any point of the circumference desired and wherever the other point touches the circumference measures an arc of 60° or an angle of 60°. See illustration. To know this will be found convenient in many other ways, all of which will suggest themselves with a little practice in problems of this nature. One-sixth of the radius of a circle equals 10° on the circumference; one-twelfth of the length of the radius equals 5° of its circumference.

TABLE OF AIR VOLUME.

C. H. Kuderer, general manager of the Avonmore Mine Fan Co., Avonmore, Pa., has compiled a table of air volumes through air ways in cubic feet per minute. The table is handy and ready reference for engineers who meet with problems of air transmission through large air ways. As an example: How much air C. F. can be passed through an 8 x 8-ft. air way under 3-in. W. G. Air way 5,000 ft. long? Looking in the table we find under 3 in. and opposite 8 ft. by 8 ft. volume 76,800 C. F. For air way 5,000 ft. long volume = constant × 76,800 = 76,800 × 0.45 = 34,560 C. F. The table is for sale by E. E. Meyer, Allegheny, Pa., at 25 cents.

A new coast chart in colors of Lake Superior (No. 4), showing the coast from Big Bay Point to Ontonagon, Mich., including the Keweenaw peninsula, has just been issued by the United States lake survey and is for sale by the MARINE REVIEW.